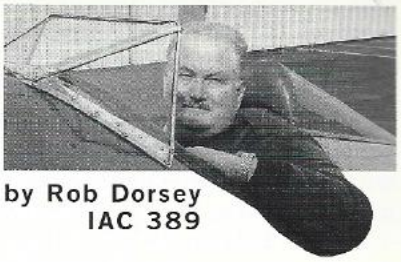


by Rob Dorsey
IAC 389

Crossover Spins

A devil of a ride if you're not ready!

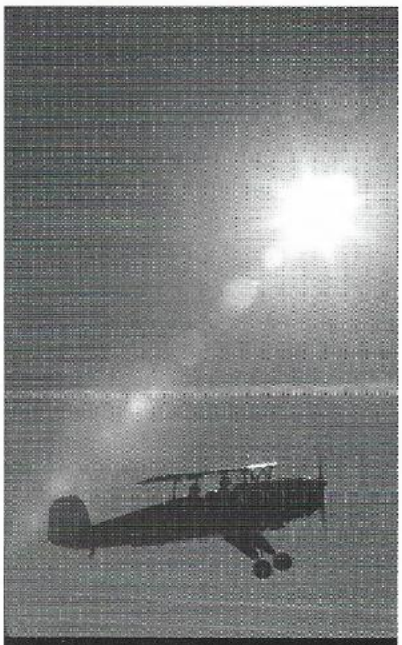
Spin accidents have taken our dearest friends from us, and they surely will again. They have brought us tears of regret, both for our loss and for the knowledge of what just a little training could have prevented. If you can't recognize the signs of a spin gone wrong and take immediate corrective action at competition altitudes, friend, you are putting yourself smack-dab in harm's way.

Nestled warmly in the front cockpit of the British Tiger Club's old Stampe, G-AWEF, I relax as we gently climb above a scattering of friendly little cumulus just north of Redhill Aerodrome over Oxted and Westerham in northwestern Kent. The year is 1970, August I think, and I am teaching aerobatics for the club.

I have the luxury of relaxing because my student, a scruffy, hippy looking young man with a wild Afro of tightly curled blond hair named John Harper, has relieved me of any flying chores. John is 26, and I am 23. This is his second lesson. On the first I introduced him to the world of inverted flight, and he was solidly hooked.

John is what the British call very keen. So keen in fact that I wonder if I would be able to keep him satisfied for long. He shows innate talent, and I am sure that he will challenge the master before we are done. He is not afraid of flying and has aggressive hands for a beginner.

I came to England to cheer on the U.S. team at RAF Hulluvington a couple of months earlier, having been graced with press credentials by Paul Poberezny. I was to send reports of the standings by wire and phone and bring back pictures. It was a great time, but by the end of the contest, I was out of money and either had to go back to Texas and beg for my spraying job back or start making a living.



Many of the older aerobatic types did not have the spin characteristics of today's modern airplanes, and accurate spin recovery could lie somewhere between skill and alchemy.

In actuality, it was poverty that brought me to the door of the British Tiger Club, the home chapter of the old American Tiger Club. The American version was the bastion of Frank Price, and I had been a member there for six years. Frank had been kind enough, as was his way, to write a glowing letter of introduction for me to Michael Jones, club manager, and, more importantly, his father, Norman, who was patron of the club.

It was this letter and the results of a flight test with the aerobatic secretary of the club that enabled me to convince the Jones boys to let me use WEF for aerobatic instruction—at a much reduced rate. It would prove to be a good deal for us both. It brought the club revenue and membership because all who learned wanted more, and the Tiger Club offered an ideal situation. They had nice old aerobatic airplanes for rent to members, access to members of the British Team on an informal basis for coaching, the camaraderie of some

wonderful aviators, Neil Williams for one, and nice Sunday afternoon teas. I am a member still. Sunday high tea is still a treat.

As we level at 3,000 feet above the Westerham Valley, I tighten my harness one more time as John begins our standard warm-up exercise, a series of 90-degree-banked lazy-eights to enhance coordination and build orientation. The old Stampe nods through the eights, and I contemplate, for about the twentieth time, how I am about to begin another aerobatic training session without a parachute.

You see, the British didn't wear the things. "Binds the limbs, really." "Bloody uncomfortable and all." And my personal favorite, "Well, it doesn't give the aeroplane a sporting chance, now does it, old boy?"

The Tiger Club didn't own a parachute, didn't know where to find one, and couldn't care less about my discomfort in not having one. It was fly without or don't fly. I flew; therefore I ate. Basic needs are marvelous motivational tools.

...we slow to nothing and the Stampe's great butterfly wings reluctantly give up the notion of flight for a while in what might pass for a stall...

It is on my mind because I am to introduce spins today, and spins could cause problems. Many of the older aerobatic types did not have the spin characteristics of today's modern airplanes, and accurate spin recovery could lie somewhere between skill and alchemy. Chipmunks had their quirks, what with rudder blanking and all. Tiger Moths were easy if spin strakes were installed, else they too could be wicked. But the Stampe was generally unproblematic if not aft loaded. Mr. Harper was a slight lad, and I was, well, much slighter than now, so CG was not an issue. Still, sitting there while someone who had not done it before took his first tenuous steps into the never-never world of autorotation tended to tighten the bowls despite my feigned confidence.

The lazy-eights exhausted, I tell John to try a spin to the left as we had briefed. In anticipation, he yanks the nose up sharply to about 30 degrees and closes the throttle, the little Gypsy Major muttering to an idle as the speed bleeds quickly off.

As we slow to nothing and the Stampe's great butterfly wings reluctantly give up the notion of flight for a while in what might pass for a stall, John boots full left rudder and snatches the stick hard

back. Old WEF obediently eases over into a good left spin, and I watch through the picture window formed by the cowl, top wing, and cabanes as the village of Bletchingly rotates beyond the nose. After three turns I call, "Right John, recover!" And he does, wow does he, man-oh-man does that boy ever recover!

In an instant the stick shoots all the way full forward, the rudder slams to the opposite limits, and both are held hard to the stops. The Stampe does a most graceful pirouette right on her nose and never hesitates spinning. In fact, the rotation rate increases a bit. The village grows in the window, but old WEF just spins on as John holds his recovery control position.

What he does not know and could not be expected to know is that he, the WEF, and I are now in a semi-accelerated, left inverted spin and will stay that way until one of us does something about it—or the village green does.

Shouting, "John, I have control!" I take hold of the stick, which oddly remains full forward of its own accord, and step on the left rudder. I then pull the stick just aft of neutral, and the WEF slows her rate and then stops, pitched just negative of the vertical. As I pull out at 1,000 feet above the farms below, I make a mental note that I owe Frank Price yet another beer.

Several years before, Frank had made me learn to spin the Great Lakes positive, negative, and then positive again, all in the same spin. He had me intentionally do what young Mr. Harper had just done, and he had reduced it simply to an exercise, a way to get down after the lesson and not waste the altitude. It was a "no big deal" event, and I had no idea at the time that, in that little spin exercise, Frank would wind up saving my life, several times over. Frank used to say, "If you pick up anything around here that you find useful in the future, you owe me a beer." A beer for a couple of dozen lives saved, including mine—some deal, huh?

Let me say it again: If the airplane is yawing toward your down foot, you have in-spin rudder and the airplane cannot stop spinning! To recover you must stop the yaw.

The thing that befuzzled my friend John, that has killed our loved ones and friends, and that has frightened the bejeezus out of many of us is a phenomenon we have come to call the "crossover spin," a fair name as names go. Perhaps a better one would be "transition spin" because that is exactly what it is. Not just one spin, with a change in mode or character as in when we accelerate an established spin, but rather another spin altogether. When we "cross over," we exit one spin and originate another, all without stopping the direction or rate of rotation. From the ground the spin would not be seen to stop, and only the knowledgeable observer would recognize that a positive spin had been turned into an inverted one. Here's how it works.

We'll assume that you have done positive (normal) and negative (inverted) spins. I use the terms positive and negative because they deal with the angle of attack, not the attitude of the aircraft. If you have not been exposed to them, then shame on you, and what are you doing flying aerobatics? Whattaya, nuts? You must realize that you may encounter either type of spin learning even the most basic of maneuvers, and let me assure you that they are much better met at altitude with a qualified instructor than at box altitude alone. Since the elevator is our tool to directly control the angle of attack, its position indicates the angle of attack. Simply put, if the stick is back, then the spin is positive. And conversely, if the stick is forward, then the angle of attack and the spin are negative.

Now, get a model airplane and work with me. Hold the model up in front of you, wings level and pitched down about 70 degrees, then rotate it counterclockwise (as seen from the top) about the vertical axis, which will produce both a big roll motion and a yawing motion. If we are in a positive spin with left rudder, the rotation about the roll axis is left and the yaw is also left. Now, flip the model over about its roll axis so that it is now 70 degrees nose-down inverted and continue to rotate it counterclockwise about the vertical axis. Again, there is a roll motion and a yawing motion. The rolling motion is still left, but the yaw is right! This is the motion of the aircraft in a right rudder inverted spin. From this you can see how the drama builds since both of these spins produce a left roll motion as seen from the ground and the cockpit!

Many of us picked up our original spin-recovery paradigm from hangar talk. In its most basic form, the hangar talk recovery was to push the stick forward and stomp on the opposite rudder. While this carries an element of truth, it is far from the whole story. If that recovery is ingrained from the earliest chirpings of our fledgling lives, we may in times of extreme stress, revert to the technique most solidly imbedded in our subconscious. We will slam the stick forward and step hard on the opposite rudder.

In a spin, even though the airplane is pointed mostly straight down, it is at a low airspeed and high angle of attack. It also has a strong rolling inertia established. A rapid and forceful application of opposite elevator can take the angle of attack from one stalled condition, say positive, to the opposite stalled condition without ever killing the

rolling inertia or reestablishing the laminar flow on the wing, breaking the stall. All that is required for mayhem is the correct yaw moment, supplied in this case by our well-intentioned opposite rudder.

In airplanes with fairly sharp wing leading edges, such as the Pitts series of aircraft, the critical angle of attack is fairly low, about 11 degrees or so. This allows for a faster transition to the opposite type of spin with a minimal change in pitch attitude. Also, if transitioning from a positive to a negative spin, the nose goes down as seen from the cockpit, increasing the illusion that we have done the right thing to break the stall and end the spin.

Now, mind you, each airplane type has its own individual characteristics, and you might even find a few examples within the same type that have different characteristics. So please take what follows as generic and not a formula for all occasions. However, should you believe that you have inadvertently transitioned into an inverted spin from the positive, you can solidify that opinion by looking for the two sure signs of spin mode. 1) Do you feel positive or negative G? Positive spins will produce about +1.5 positive G; inverted/negative spins will produce about -1.5 Gs. If you are not somewhere between highly stressed and scared witless, you should notice the change. 2) Ascertain the yawing direction. Look straight out the nose. If it is yawing toward your depressed foot, you are applying in-spin rudder, regardless of roll direction! If you have a needle and ball, the needle will also tell you which way you are yawing. To apply opposite rudder you would step away from the deflected needle. The ball will generally be on the opposite side, but not always.

Let me say it again: If the airplane is yawing toward your down foot, you have in-spin rudder and the airplane cannot stop spinning!

To recover you must stop the yaw. Apply rudder opposite the yaw direction and position the elevator to the place you would normally put it in a spin recovery. Mueller-Beggs says let go of it. While this may work in most Pitts and some others, get advice as to whether this is appropriate in your airplane. Either way, you must identify the yaw direction and oppose it with brisk and full rudder deflection, removing it as soon as the spin stops.

By the way, John Harper went on to get pretty good at aerobatics. As a four-time member of the British Team, he competed from Moscow to Fond du Lac. During and afterward, he pursued a successful 25-year career as a professional air show pilot. Harpo, as he is called by those who know him well, can still be tempted to leave his croft up in the Orkneys to provide aerobatic coaching and instruction. I am sure that by now he owes Frank a few beers himself.