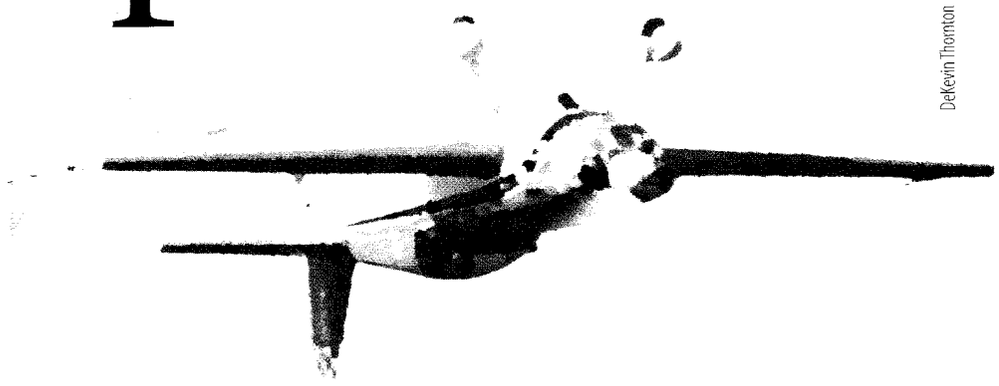
Inverted Spins



Dekevin Thornton

Fear or misinformation?

By Bill Finagin

Inverted spins ... why does that term cause fear and trepidation in many pilots? Just where, exactly, does this fear come from? Is it the fear of an airplane failing to "come out" of an inverted spin? Does it come from misinformation that is amplified by "macho pilots?" Regardless of your answer, let us examine some myths and then discuss an inverted spin.

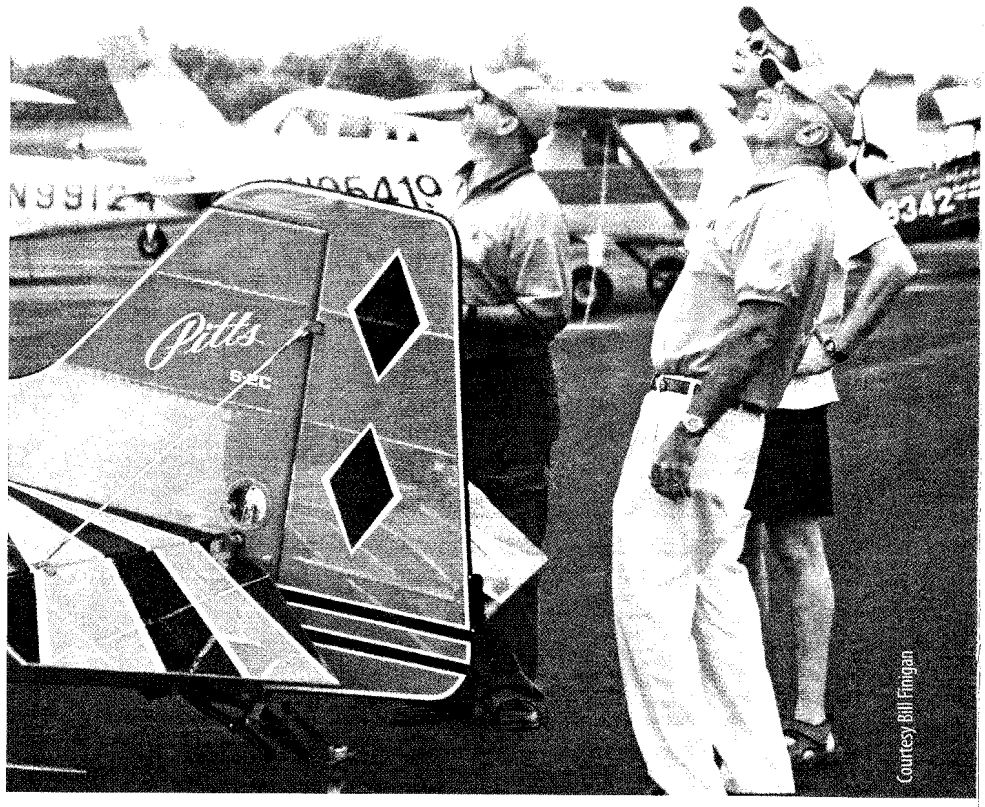
First, let's try to erase all the myths and garbage we have heard from many well-meaning pilots (or "baloney artists" who masquerade as pilots) and try to understand just what is taking place in an inverted spin. Not unlike a marathon runner or a rifle expert or a skier, we must first master the basics. A good starting point is to master flying inverted. Practice flying straight and level until you are comfortable being "upside down." Next, try turning 90 degrees right and left and recovering straight ahead while flying inverted. Note here that to turn right (as viewed from the cockpit) you must lower the right wing toward the ground. This requires deflecting the stick to the left, which feels very unnatural. Next, try practicing simple, straightforward stalls while inverted. Remember, unless you have installed an inclinometer (upside down) do not look at the ball – it will not tell you anything. Some of you might be so smart that you recall that the instrument might be useful if you look at the small air bubble. You are technically correct, but in general just remember that the ball does not work when upside down.

After practicing stalls and recoveries upside down you are ready to progress to inverted spins. Hopefully they will seem less scary when considered simply as the next step in a progression of inverted maneuvers. Before spinning, let's review what the controls are doing when flying inverted. We begin with the stick. Flying straight and level while inverted, we see, if we look to the side, that we must generally keep a slightly higher angle of attack in most aircraft than when flying right side up, particularly if we are using a sighting device as our reference. It feels strange using the stick, because movement appears to be reversed in that you push the stick forward to gain altitude and pull the stick rearward to lower altitude. Next we examine the roll, or the aileron movement, in a turn. In order to bank right in a right turn (as viewed from the cockpit), we will lower the right wing toward the ground by moving the stick to the LEFT. Try to remember that you are effectively rolling left to turn right. Don't get hung up on these facts; just continue and keep learning – arguing just stops your learning process.

A good technique that might help you to understand control inputs is to get a model or use your right hand to "hangar fly" the maneuver. If you always use your right hand as the "airplane" when hangar flying, you will see that your thumb is always going to point in the direction of a left turn. Simply lower your thumb toward the ground and turn in your thumb's direction. Why are these seemingly trivial items important? We will see momentarily in the flying.

Now we are going to do our first inverted spin. We are, for this discussion, flying in a Pitts S2C. We are tooling along at about 120 mph. We now roll the aircraft to inverted, nice and easy, remembering to use sky rudder to keep the nose from falling toward the ground. Once we are upside down we keep things straight and level toward a point in front of the aircraft's nose. We reduce throttle, keeping an eye on the airspeed indicator, just glancing at it every five seconds or so because our primary attention should be on keeping the nose straight and increasing our angle of attack to maintain altitude. As we reduce our power to idle and continue to raise the nose skyward, we will eventually feel a stall coming on. Add a final full forward deflection of the stick as the stall occurs. It is exactly like the one we use when upright, except our senses are all "screwed up" and it feels very different. As it stalls we push either the left or right rudder all the way to the firewall and keep it there. With the stick fully forward and the rudder fully deflected, let's say to the left, the plane will begin to spin to the left (as viewed from the cockpit).

Let's stop here and define a little more thoroughly just what is going on in an inverted spin and how one should describe it. There are two perspectives, one from the cockpit and another from the ground. From now on, we will define an inverted spin to the left or right based on which rudder pedal is being applied. Always describe the inverted spin as "inverted left rudder spin" or "inverted right rudder spin." If you are inverted spinning with the left rudder pedal depressed to the firewall, you will look over the nose and see that it is moving to the left. If you are pressing the right rudder in an inverted spin, the nose will be moving to the right.



Knowing what the airplane looks like from the ground helps pilots understand the effect of control inputs. Contests provide an excellent opportunity to develop your "ground perspective" as you watch competitors fly.

In this example flight we are inverted and spinning with the stick held fully forward and the rudder pedal fully depressed to the left; thus, by definition we are in an inverted left rudder spin. Looking over the nose, which is where our eyes are supposed to be 95 percent of the time, we will see that the nose is moving to the left in relation to the ground. So, before we go brain-dead from our new maneuver, we simply reverse the rudder, remembering that the nose always moves toward too much rudder, and observe the nose to slow down in rotation. As it comes almost to a stop, we now release the forward pressure on the stick and let it come back to the neutral position. Keeping the rudder pedals still and in a neutral position, we then push the stick forward to recover straight and level in the inverted position. Our second choice is to recover into an upright position by continuing to pull the stick back after stopping the rotation, so we recover in the upright position.

Always do this training with an instructor in the airplane with you. It makes it much safer, and he/she can tell you about mistakes you have made or suggest small corrections that can greatly improve your technique and quality of the maneuver.

First and foremost is the fact that you are pumping a lot of adrenalin in your body, and as a consequence you will most likely fly like a gorilla and overcontrol your airplane. That is why training is so important. You want to make it feel natural, and only by practicing can that be accomplished. Second, almost all new students will not hold the stick fully forward. Remember your first roll? How many of us really completed that first roll? I can tell you that, of the people flying with me the first time they attempted an "unassisted aileron roll," 80 percent stopped less than half way around. Heck, I did, and I was in a Champ 7AC at 2,000 feet with no training and no backseat instructor. I was also a very stupid 17 years old! That story is a candidate for the "never again" column!

The third item many pilots screw up is the rudder position. They forget to hold the rudder pedal fully depressed. Not purposefully, just brain-dumb! But, the combination of incorrect stick and faulty rudder pedal pressure can create some quite interesting figures.

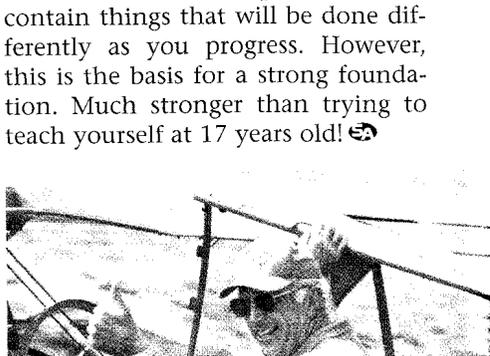
So, let's move along after practicing the inverted right and left rudder spins to a more advanced inverted spin. We will tackle the inverted flat spin. Just reading this will give some the "willies" (no pun intended!). Remember, when doing the upright flat spin we must spin to the left in the Pitts because of the engine turning clockwise, as viewed from the cockpit, and thus causing gyroscopic moments that will raise the nose when going left while advancing the throttle. Since we are inverted, we must realize that our inverted flat spin must be done to the right, which means using right rudder pedal deflection.

We are cruising at about 120 mph, and we slowly roll to the inverted position, keeping the nose straightforward, wings level, and our flight path level while remembering to keep our eyes over the nose of the aircraft most of the time. We begin to reduce the power and slow the aircraft. We push the stick forward to maintain altitude as well and to compensate for the changing angle of attack that we must keep increasing. Removing any remaining power will bring us to a stall rather quickly. When the stall warning comes we will lead a slight amount of right rudder to ensure the right wing stalls first and we will rotate to the right. As the aircraft stalls we push full right rudder pedal as we continue to hold the stick fully forward. As the plane enters the spin (watching the nose move to the right in relation to the ground) we will now move the stick to the full right forward position. Most of us will call this "in stick aileron," as the stick is on the inside of the rotation of the aircraft. By moving the stick toward the right, the right wing ailerons move toward the ground, thus creating more lift and more drag at the same time. The right wing lifts and makes the right and left wings more horizontal to the earth as the plane rotates in a tighter (smaller) diameter, thus increasing the rate of rotation.

As soon as you move the stick to the right, increase your throttle to cruise power. This will effectively increase the prop blast over your elevator, which is deflected toward the sky (remember, the stick is still forward), and the tail appears to move faster toward the earth, thus giving you the effect that the nose is raising more to the sky. We are now in a fully developed flat spin. Now we will reverse the procedure to recover.

First we reduce the power; next, we remove the ailerons by centering the stick while maintaining a fully forward deflection. We are now in the exact same position as we were in recovering from the previous inverted spin. We'll recover using the same technique: opposite rudder until slowing to almost no rotation. Then, as you hold neutral rudder, let the stick passively come back to neutral and recover from the dive.

We will discuss other inverted spins in a future article. Read and reread this article. It is a beginning. There are other techniques, and some contain things that will be done differently as you progress. However, this is the basis for a strong foundation. Much stronger than trying to teach yourself at 17 years old!



Courtesy Bill Finigan

Bill Finagin's reputation (most notably in Pitts aircraft) has taken him to instructing assignments throughout the world and attracted international students to his hangar.