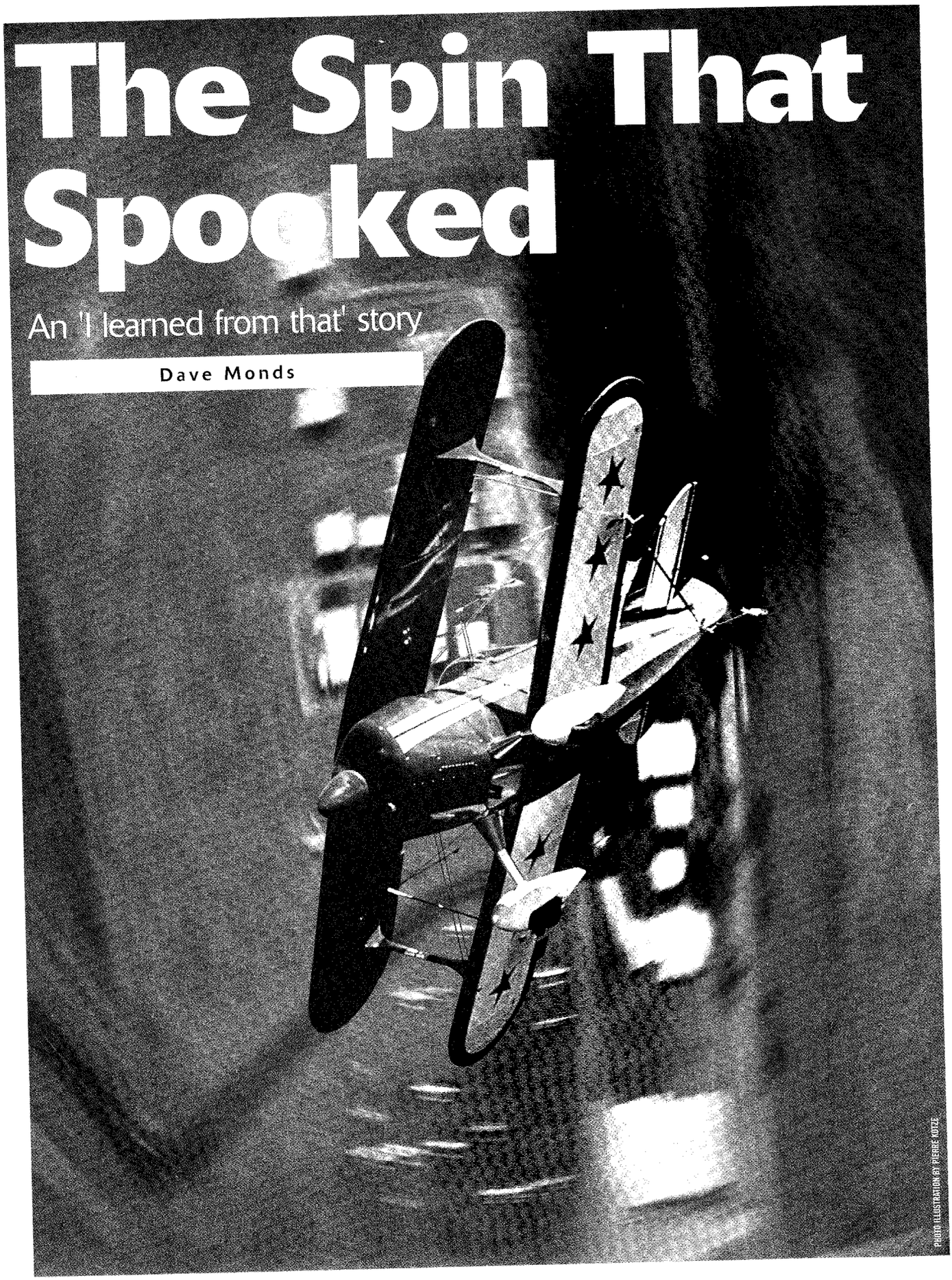
The Spin That Spooked

An 'I learned from that' story

Dave Monds



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pinning is a joyous activity that enables both learning and understanding while building confidence.

In spite of its bad reputation, the spin is just a result of aerodynamic principles that, when understood, can be controlled as with any other maneuver in flight.

Because I teach aerobatics, I felt confident I understood spinning from both a theoretical standpoint and practical point of view, having spent many hours working on just that.

I even remember the personal milestone as I gained control of the inverted flat spin.

I had read in Gene Beggs' book *Spins in the Pitts Special* that spins would be predominantly flatter in the direction of precession, which means a force applied to the prop will have an effect 90 degrees further on from where the force was first applied.

In a Pitts with a Lycoming engine and a clockwise rotating propeller as seen from the cockpit, this means left rudder will precess to the top of the propeller, causing the nose to rise. If right rudder is applied, the resulting force is acting downward on the nose, thus preventing the spin from becoming flat.

This applies for inverted and upright spins but the direction is reversed when inverted, that is, left rudder flattens the spin when upright and right rudder flattens the spin when inverted.

I wanted to test this principle after hearing comments that flat spins were actually possible in the other direction. Only one other factor, aside from a significantly aft center of gravity, would enable the spin to flatten: aileron.

When holding out-spin aileron the effects can be noted by looking at the angle of attack of the two sides of the wing, the left and right.

In a spin the wings are both stalled and both still producing lift; the catch is that one is more heavily stalled than the other, thus providing lift asymmetrically. The effect of this is a steep, non-accelerating, relatively uncontrolled spiral descent.

Spinning involves movement about all axes, with roll, yaw, and pitch working as independent moments. These moments are different in every individual aircraft for various reasons and will cause different spin tendencies and characteristics. That means new spins must be approached cautiously when flying a different aircraft, even of the same type and model.

During a basic, incipient spin, most of the time roll and yaw is so similar as to be undetectable as two separate events. Imagine an aircraft spinning to the left, that is, with left rudder applied. If full right aileron is applied to the developed spin, the outboard wing, in this case the right, will reduce the lift it is creating due to the deflection of the aileron upward from the wing disturbing the flow of air.

The effect of this is the subsequent lifting of the left wing to slow down the rate of roll down. It can be noted then, that the spin is relying almost solely on the yaw for its rotation.

To recover from a flat spin, most placards in aerobatic aircraft suggest aileron in the direction of the spin. This results in the spin steepening, which increases the roll rate and makes it easier to unstall the wing and stop the rotation.

Be aware, though, that not all aircraft will respond in this way, so take adequate care to research the spin characteristics of the airplane you're flying.

I took our Pitts S-2B out to test the effect of aileron and power on right rudder upright spins and left rudder inverted spins. I was flying one up, within the aerobatic weight envelope and center of gravity limits.

I made the first spin from 6,000 feet AGL, a right-rudder spin with power off and aileron neutral. The

spin was docile and took a good rotation to develop. Recovery was effortless.

I tried to accelerate the next spin after entry, but I applied forward stick too quickly and the wing unstalled and the aircraft fell out of the spin after a rotation. On my next attempt, I let the spin develop further before applying forward stick. The aircraft wound up quickly with identification of outside reference points becoming more difficult.

Feeling comfortable with the upright spin to the right I planned to introduce power and aileron to the next spin to see how much it would flatten. The entry was normal, and I began increasing power after a rotation. There was a slight flattening, but otherwise the spin was still rolling and steep.

I then applied full left aileron, with the stick still fully aft, and noticed a significant flattening of the spin. Satisfied the spin was flat but not nearly as much as in the left-hand direction with power assisting, I put the stick fully forward and left to accelerate.

What happened next was breathtaking. The spin wrapped up tightly, and the rotation went ballistic.

I have experienced all types of spins and snaps previously, but the rate of rotation here was beyond anything I had seen in the Pitts. Nothing outside the aircraft was discernable except what was above and below the horizon, ground, and sky.

I noticed the feeling of being a long way from the controls as I was pushed against the left cockpit wall. In reality, I hadn't moved an inch—my harness saw to that—but the extreme sideways force can create this illusion.

I let the spin continue for several more rotations, more stumped by it than anything else. I caught a glimpse of the altimeter as it was winding down quickly through 5,000 feet. For the recovery I did everything normally: cut the power completely, applied full left rudder, and put the stick forward centrally.

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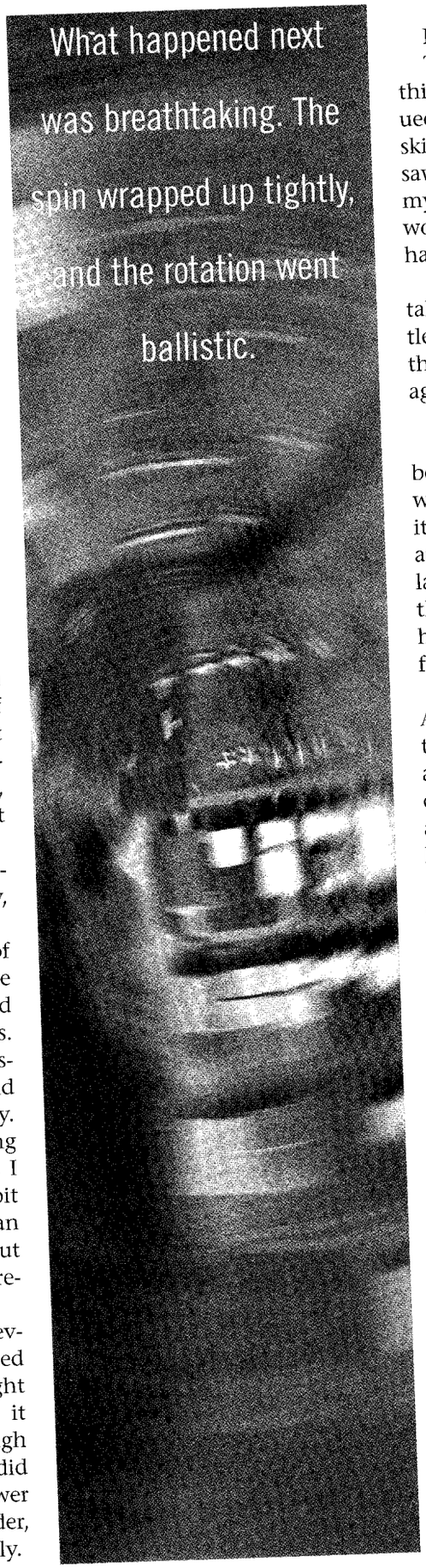

Nothing happened.

The spin hesitated slightly, as if thinking about it, and then continued spinning furiously. My heart skipped a couple of beats, and I saw the accident report clearly in my mind. I felt annoyed that I wouldn't be able to tell them what happened.

I made another attempt, this time taking extra care to ensure the throttle was fully closed. It was. I released the stick and then pushed it forward again with left rudder.

Still nothing; the spin continued.

I felt confident the aircraft could be recovered, but a little spark of worry did begin to appear. I was sure it was my technique that needed attention. My third attempt was my last idea. I let the stick go, released the rudder, and then reapplied it so hard that I thought I might lose my foot through the propeller arc.

Finally, the spin rotation slowed. After a further two frustrating rotations it popped out of the stall and gracefully flew away in a steep descent. I'm sure the airplane looked a bit guilty and said, "What? Don't look at me."

Feeling intrigued by this experience I climbed back up and did two more spins of the same type to try and reproduce my phantom almost-unrecoverable spin. Both times the aircraft entered the spin, went bananas, and then the spin stopped predictably within a rotation when I initiated the recovery.

I was really stumped, but I thought I had an idea about what had happened. I went through the same sequence with inverted spins and found nothing out of the ordinary. All of the spins went by the book. I finished off with a run-through of an advanced sequence and then returned to land.

I kept thinking about it, and eventually it dawned on me what must have happened. It appeared to be something I had read about but never experienced. The problem had to do with my technique and its effect on the heavily

disrupted airflow the aircraft was experiencing.

I realized the spin was so aggressive because precession from the propeller was forcing the nose down further, accelerating the rate of rotation. When I initiated the recovery I already had the stick fully forward, in the front left corner. I didn't release it; I simply neutralized the ailerons. I changed rudder at the same time so the spin was still accelerated.

The rudder was useless. The engine was idling so there was reduced slipstream and the high rate of rotation meant the air wasn't flowing over the tail cleanly. In fact, it was flying sideways. The high asymmetric lift of the wings was too much for the poor rudder to overcome.

When I finally tried the emergency spin recovery technique—power off, letting go of the stick, and applying FULL opposite rudder—the aircraft was allowed first to resume a normal spin mode allowing for an eventual recovery.

A pretty intensive way to learn that lesson but informative nonetheless, and I was glad to have discovered that at altitude rather than during low-level practice.

I'm sure that has been the cause of more than one spin-related accident.

These are the key points to remember:

When in doubt, always revert to the emergency spin recovery technique.

Ensure adequate altitude when practicing spinning or trying something new.

Carefully think of the principles involved prior to spinning.

Always get instruction from an experienced aerobatic instructor before attempting anything you are unfamiliar with.

One other thing that is important to remember is that this spin testing was done in a Pitts S-2B. All standard, unmodified, Pitts should exhibit similar spinning characteristics, but it can't be assumed that the emergency technique will work in other aircraft types.

I recommend getting hold of Gene Beggs' book, *Spins in the Pitts Special,* for more details on aircraft types that the emergency spin recovery technique doesn't work in.

Remember also that whenever you attempt a spin mode, give yourself plenty of altitude and rehearse an evacuation procedure on the ground beforehand. Establish a minimum height to evacuate should the spin be unrecoverable.

Providing you have a parachute, of course.

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