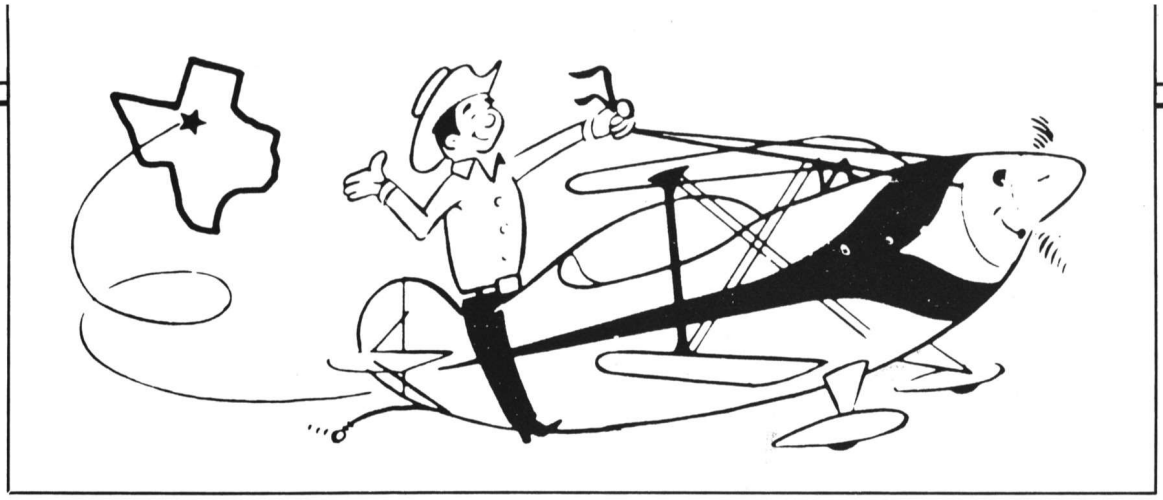

SPINOFFS

From 'Out Spinning with Beggs'

By Gene Beggs
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Dear Mr. Beggs:

This is in reference to your article, "A Universal Recovery Method," in the August issue of SPORT AVIATION. I found it extremely interesting and I am sure there are many who share my opinion.

You may find it surprising that an old-timer of 73 is writing to you on the subject. However, there was a time when we oldsters were also young and in love with flying and aeroplanes. Just as the young generation of nowadays, we dreamed, designed, built and flew the crafts we considered as progressed prototypes. The little group of enthusiasts, we organized, built and flew no less than five such experimental prototypes. And I say it with some pride, all were successful.

Among them was a biplane of very small dimensions capable of aerobatics. It was stressed with 12 Gs positive and it was powered with the small and very light English "Pobjoy" engine, 80 HP with a three to one reduction gear. For advanced aerobatics this power certainly was not enough, but for green beginners like us it was plenty. The very wide diameter of the prop was not the best for speed. Sweeping the air like a broom in front of the craft, it produced a lot of traction power, and vice versa, a lot of braking in diving.

So here we had an efficient little machine we could fly and use to try our skills. The little craft was very responsive and extremely light on the stick (you could pilot it with two fingers). The general impression was that you could do just about anything with it.

But we knew better than that! We knew that crazy maneuvers can end up in a spin. We also knew there are some different types of spins of which we had only a faint idea. Besides, spins at low altitude were almost always fatal and we were aware how little we knew about the nature of spins or the ways to recover. Accordingly we were afraid of them. The impression lives with you, and I am still most interested in the behavior of a new plane approaching deep stall.

Now, if you want to fly aerobatics, you must not be afraid of spins! You've got to master them!

Following this philosophy I took the little plane really high, right up to some 9,000 ft. where I tried to spin it for the first time. Power off, I would lightly lift the nose to stall the bird and, as it hesitated, I would apply full left rudder, full right aileron and the stick on the belly. Reluctantly, it would first show a tendency to follow the aileron. Then the rudder took over, overpowering the said tendency. Gently it would pull the plane into a left spin — nose down at about 45° to Mother Earth.

As soon as the spin fully developed I would return all commands to their neutral position and — so it seemed — the machine recovered all by itself. That was rather encouraging.

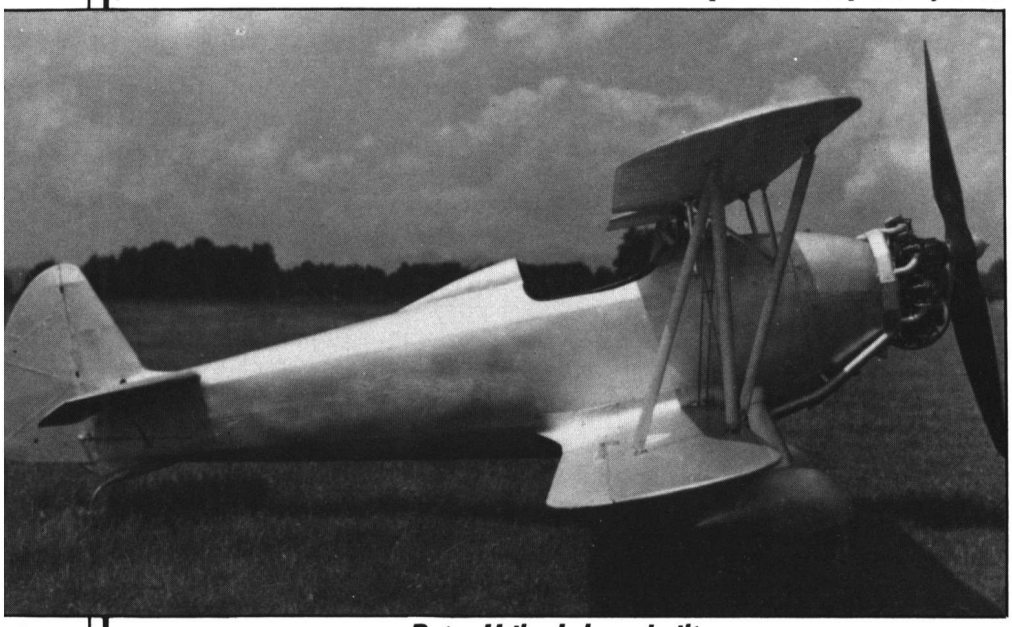
Very soon in the game I noticed something interesting to which I still have no explanation. Anytime I got the machine spinning and returned the rudder and stick to their neutral position, I could feel a light, characteristic and pronounced pressure on the stick, sort of a "hard spot." Pushing the stick forward to overcome that "hard spot," the plane would recover immediately. Trying the maneuver again and again with the same result I considered the trick a precious discovery. Soon I would use it with confidence. As my confidence increased, so did the number of turns in spins.

Parachutes were a rarity in those times. The Air Force used them, but to us, civilians, they appeared expensive, big and heavy. Also, rarely could someone be found who really knew how to fold a chute, making it ready for use. Furthermore, we hardly considered them over-reliable. So, we did not worry much about chutes and simply flew without them. However, to retain some measure of security, we practiced aerobatics always at respectable altitudes.

I felt more and more secure with my system of recovery and soon I would try spins at lower altitudes. This practicing eventually ended up in a rather neat performance: the feat was 10 full turns in a spin from an altitude of 1000m. (3280 ft.) above ground, recovering at about 150m (500ft). As usual, I would have kept all commands in the middle, the stick at the familiar "hard spot," and my eyes glued to the altimeter.

There was a huge building complex for a paper mill below and that complex was painted all white. In spins, I could see it flashing by without really watching and that became my standard way of counting the turns. During that last performance (the 10 turns), a performance still very much that of a beginner, I found it difficult to persevere and spin the craft for so long. After the seventh turn the ground looked so close that I could grab it with my hand, and I found it difficult to believe my altimeter. Eight!

And just before the ninth turn flashed by, I pushed the stick forward to overcome the "hard spot." Alarmed, I noticed that the machine was not recovering as fast as usual. It took one and ¾ turns this time before she recovered and smoothly slid in a straight dive. To me it looked like eternity.



Peter Hribar's homebuilt.

I felt a bit dizzy at first and kept my eyes on the horizon to keep the plane flying reasonably straight. However, the sensation was short lived and the rest of the story was all normal flying.

It must have looked a bit funny on the ground where, by chance, the airport manager was watching my performance. As he told me after landing, he was dead sure I got caught in a spin and couldn't get out of it.

I am afraid I lost too many words to describe my little episode. I did so because it so clearly contradicts your article. In fact, I wonder now — how come I am still alive? According to your article, my little plane should not have recovered after I pushed the stick over the "hard spot." It should have, instead, increased the rate of rotation with little chance of recovering.

I wish I had a chance to read your article at that long passed time when I was young and active. How interesting, informative and persuasive is your discourse! How happy I would have felt at that time reading about the secrets of spins and recovery you so aptly chat about. At that time, I believe, I would fly promptly to high altitudes and try systematically all the maneuvers you wrote about. At this time, I hope, many young pilots will do just that.

As for me, I am at odds with the doctor who says I am too deaf to pass the medical! Well, at 73, it's perhaps time to think of angels' wings and how to fly to heaven.

But that still leaves me with an unanswered question. Why did my little machine so reliably recover after a wrong input by pushing the stick forward when, in fact, it should continue to spin, only at a faster rate?! And another question on my mind — what would have happened if I would have ended up in an inverted spin?

I wish I could read a book explaining the theory of a spin by an aerodynamic approach. Perhaps, there are some logical answers to seemingly contradictory notions?

If time ever permits you, sir, I would be most interested and truly grateful if you would honor me with a brief comment. As a matter-of-fact, I never before had a chance to read a discourse about spins and recovery, at least not by an expert and teacher of such broad experience as yours. I read your article twice, slowly and carefully. And I think, I am going to read it a third time after a while — even though I have no chance to ever fly again.

Most sincerely
Peter Hribar
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P.S. Please, forgive me my poor style and spelling. Have never seen an English class inside!

• • •

Dear Peter,

Thank you so much for your nice letter and the picture of the little biplane that you built. Your description of the experience that you had so many years ago in your little biplane was very touching. I want to try and explain to you what I believe happened.

It sounds like your biplane was a nice spinning, very forgiving little machine. You described how you would place it into a spin by pulling the power to idle, stalling the aircraft, and then pulling the elevator fully back, pushing full left rudder. This is a perfectly described, classic entry into a normal spin. However, you stated that you applied full "right" aileron at the same time, which is the way you enter a flat spin! The normal spin should be done with the ailerons in the neutral position!

The application of opposite aileron flattens the spin by increasing the angle of attack and hence the drag on the inside, or downgoing wing. This increase in the lift and drag of the inside wing brings the inside wing up. It has the opposite effect on the outside wing panel and increases the rate of rotation of the spin. It produces a spin in which the wing is parallel to the horizon. At this time, the spin becomes one of only yaw — a true flat spin in which there is no bank, only yaw.

Once the airplane stabilizes into this flat spin, the flight path becomes vertical down, producing a relative wind which flows up through the tail surfaces holding the elevators in the stalled position. With the tail describing an arc, this also produces a certain relative wind for the rudder and vertical tail surfaces from the side. The combined effect of these two relative flows of air tends to hold the airplane in the spin all on its own. It also tends

to hold the elevator in the stalled condition and to hold the rudder "in spin."

Under these conditions, the aircraft will usually continue to spin all by itself without the pilot having to hold any control input whatsoever. The position of the center of gravity relative to the wing's center of pressure, the overall weight of the aircraft and its associated "flywheel effect" etc. will all affect what the aircraft will do when the pilot just turns loose of the controls.

Usually, any airplane will eventually come out of the spin by itself if the pilot will just cut the power and turn everything loose, but not every time! It just depends on the airplane. Of course, the pilot may not have time or altitude available to wait for the airplane to recover on its own.

When a pilot completely releases all controls and lets them seek their own position while the aircraft is spinning, he will find that the elevator will remain in the stalled position of the stick, the ailerons will always go slightly in spin and the rudder will lay over into the direction of the yaw. If the pilot will then be sure that the power is completely off, apply absolutely full opposite rudder and wait, the aircraft will recover — if it is capable of recovering at all.

When the rate of rotation of the spin slows to the point at which the natural nose heavy condition of the aircraft takes over from the centrifugal forces generated by the rotating masses located ahead of and behind the center of pressure of the wing, the nose will pitch down all on its own. The rotation of the spin will abruptly stop. The stick will move immediately to the true neutral position, as the flow of air over the control surfaces of the elevator and ailerons streamlines these surfaces. The only thing the pilot has to do at that moment is to neutralize the rudders, take hold of the stick and smoothly pull the aircraft out to straight and level.

Now, let's go back to the particular situation that you described in the letter. You described how, when you neutralized all controls, you felt a "hard spot" in the elevator. This was caused by the flow of air up past the elevators as the aircraft descended in the spin. When you push the elevators forward against this relative flow of air up past the tail surfaces, of course, you will feel pressure against the stick.

Now, what the aircraft does when you push the stick forward in the case of an upright, stick back spin, or when you pull the stick back in the case of an inverted spin, will depend on what you have first done with the rudders! To simplify that, one must say that it depends on what you have done first with the rudders — before you apply "nose down" elevator. That determines whether the aircraft is going to come out of the spin immediately or whether it is simply going to accelerate the rate of rotation.

If the pilot has first applied full opposite rudder against the rotation, the aircraft will recover almost immediately when the nose down elevator is applied. If, however, on the other hand, the pilot still has full in-spin rudder applied when the nose down elevator is applied, the rate of rotation will increase dramatically. The aircraft will not recover then from the spin even in spite of full nose down elevator as long as the in-spin rudder is held. The reason that the aircraft cannot recover is because of the strong inertial forces created by the center of gravity of the mass of the aircraft located ahead of the center of pressure of the wing as well as that located behind the center of pressure. As the autorotation continues, due to the unequal stalled condition and hence the unequal lift and drag of the two wings, these inertial forces produced by these two center of masses — ahead and behind the point about which the aircraft is yawing — create enough centrifugal force trying to hold the aircraft in the stalled condition that the full nose down elevator is not powerful enough. It cannot "push" the aircraft on through the point at which the stall will be broken. In these accelerated spins, the pilot can cycle the stick all the way from stop to stop — doing anything he wants to do with the stick, left aileron, right aileron, stick back, foward or whatever — and the aircraft will not recover as long as the pilot is still on that "in-spin" rudder!

. . . what the aircraft does . . . will depend on what you have first done with the rudders!

Again, let me emphasize that the rudder is the key to spin recovery! The power and the stick can really get you into trouble. If you will simply cut the power and take your hand off the stick, the aerodynamic forces at work will place that stick in the most perfect position to set the aircraft up for the recovery. This will be accomplished by simply applying full opposite rudder! It really is that simple!

Again, let's go back to the spin incident that you described in your letter. You state in your letter than my article clearly contradicts what you experienced in your little biplane on the day in question. You further state that your airplane should have simply accelerated its rate of rotation when you pushed the elevator past that "hard spot," instead of recovering if my theories are correct.

No, I must disagree with you! I say that your aircraft behaved in a perfectly predictable manner and that what you described in your letter goes along perfectly with my articles and theories! Please let me explain.

Your recovery technique that you developed and trusted with your life was probably reliable enough to depend on so long as you truly had the rudders in the neutral position — and as long as the center of gravity did not change. However, it was very dangerous and unpredictable if you should inadvertently be holding some "in-spin" rudder.

You described how you would neutralize all controls. Then, when you wanted to recover, you would push the stick forward, through the "hard spot." The aircraft would recover. After the explanation in an earlier paragraph regarding the use of the rudder before applying nose down elevator, I am sure you can now see what happened to you on the day in question when your aircraft did not recover as you expected. I am quite sure that you were holding, inadvertently, a little bit of "in-spin" rudder.

Peter, I hope I have answered the questions you had in your mind regarding your experience in the spin in your airplane. Again, let me thank you for your interesting letter and the picture. The words that you used in your letter could have only come from the heart of a man who has "been there."

I am very sorry that your doctor does not see fit to give you your medical certificate so that you may continue to enjoy the thrill of flying. Personally I cannot see where being even totally deaf should keep an individual

from flying from airports that are not controlled by radio! Have you considered applying for a waiver on this point and perhaps having a restriction placed on your license that would simply restrict you from flying out of controlled airports?

You must also accept my apologies for my ineptness at writing and sentence structure. I am very sure that my old high school English teacher would deny any accusations that she taught me how to write. Anyway, it's the thought that counts and as long as the thought is conveyed — who cares — right?! Besides, flying is a lot more fun than talking and writing about it anyway!

Sincerely,
Gene

CARBS TARGETED AFTER CRASH

Following reprinted from 6/85 AVIATION magazine and applies to IACers with Cessna Aerobats and 7ECA Citabrias and most aircraft without inverted fuel systems.

The crash of a Cessna 152, N25496 in June 1984 has prompted the National Transportation Safety Board to issue a list of Safety Recommendations aimed at improving the carburetor used in the crash aircraft.

The board reported that N25496 was departing from McComas-Lee's Municipal Airport on June 28, 1984, when a power loss led to a crash that substantially damaged the aircraft. There were no injuries.

"The power loss occurred when the primary venturi in the Marvel-Schebler Model MA3A carburetor dislodged and jammed against the throttle valve," the board stated, adding that more than 20 years earlier, the Federal Aviation Administration had issued a warning concerning the same type of malfunction in a similar Marvel-Schebler carburetor.

"In 1963, the FAA issued Airworthiness Directive 63-22-03 applicable to all Marvel-Schebler Model MA4-5 carburetors not having the one-piece combination primary and main venturi," the board stated. The AD warned that the primary venturi may become loose, "resulting in wear of the primary venturi support legs on the ends contacting the carburetor body and at the retaining clip area. As a result, the retaining clips may become dislodged or dislocated. This can cause erratic engine operation or complete engine stoppage," the AD said. To preclude such an occurrence, the AD required the installation of a one-piece combination primary and main venturi at the next carburetor removal, or overhaul of either the carburetor or engine, whichever occurred first.

In its findings following the 1984 accident, the Safety Board stated that Marvel-Schebler carburetors are installed in a substantial number of general aviation airplanes. The venturi system in some of the carburetors consists of a one-piece combination primary and main venturi, but other models, including the MA3A, incorporate a two-piece system consisting of a separate primary and main venturi. "The primary venturi in the two-piece venturi system is intended to be held in place by three retaining clips," the board's report stated. "However, the retaining clips and/or the arms of the primary venturi often break, allowing movement of the venturi within the main body of the carburetor. This movement can result in a loss of power or engine roughness since the venturi may block the mixing chamber/throttle bore or nozzle outlet, or lodge against the throttle valve."

During a five-year period ending last year, 26 Service Difficulty Reports were submitted to the FAA's Maintenance Analysis Center regarding problems with the primary venturi in Marvel-Schebler MA3, MA4 and MA6 series carburetors. The problems identified were similar to those referred to in the 1963 AD and to the problem experienced in the crash of N25496, according to the Safety Board. These Service Difficulty Reports included statements such as: "The main venturi came loose and lodged against throttle valve;" "lost power during takeoff, found venturi loose in carburetor throat, no sign of retainer clips;" "carburetor venturi broke loose at all three attach points, engine ran very rough;" "found venturi mount legs broken;" and "power loss due to broken primary venturi, venturi ingested in intake manifold." The board added that seven accidents and one incident have occurred since 1977 as a result of loose, missing or damaged primary venturis in Marvel-Schebler carburetors.

The Safety Board has recommended that the FAA:

- Issue an Airworthiness Directive requiring that Marvel-Schebler Model MA3, MA4 and MA6 series carburetors be inspected at the next 100-hour or annual inspection, and at appropriate intervals thereafter until the two-piece venturi system is replaced with a one-piece combination primary and main venturi, to verify the integrity and proper location of the primary and the main venturis;
- Require the Facet Aerospace Products Company to (1) incorporate a one-piece combination primary and main venturi in all future production of Marvel-Schebler MA3, MA4 and MA6 series carburetors and (2) design a replacement one-piece combination primary and main venturi for use in retrofitting existing carburetors in the foregoing series.