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All right! Can't a guy get away from civilization for a while, safely out of e-mail range, without the world falling apart? Ok, ok, maybe only that sliver of the world that cares about stalls and spins in light airplanes. I come home after nearly three weeks traversing the Pacific Northwest giving seminars and stalling, spinning, looping, and rolling airplanes (what could be better than spinning an Aerobat along side Orcas Island?) and what do I find? SPAM--lots and lots of Spam thanks to the SoBig virus, which has wormed its way into aviation address books. But sandwiched in between the layers of Spam, legitimate e-mails from pilots troubled by the recent AOPA study on stalls and spins. Naturally, I'm right in the middle of switching ISP's too, so easy access to the Internet is cut off until the end of the month...

Anyway, thanks to all for the heads up. I've read through the study and have cobbled together my thoughts, opinions, and analysis. Much of what appears below comes from various parts of the stall/spin book I've been working on. I must also preface my remarks thusly:

1. I've been a member of AOPA since 1984.
2. I've supported AOPA on a number of issues over the years.
3. I believe AOPA provides a lot of useful information for pilots through the Air Safety Foundation, its various publications, and innovative programs such as Seminars-in-a-Box.
4. AOPA's [Pilot](#) and [Flight Training](#) magazines have been supportive of my work over the years, for which I remain forever appreciative.
5. As in any long-term relationship, AOPA and I have respectfully disagreed on a few subjects.
6. My opinions on the two central questions in the stall/spin debate: Is spin training beneficial -- YES; Is it feasible to re-institute a national spin training requirement for private pilot applicants -- NO. Though beneficial, the infrastructure does not exist for spin training to be conducted safely on a national scale.

It is with all due respect to AOPA as an organization that I offer the following critique of the newly released stall/spin study. The intent is to reinforce the valid points, clarify the ambiguous ones, debunk the persistent stall/spin myths, and in the end, help to expand our understanding



of the stall/spin accident picture so that pilots can take logical, informed steps to improve their stall/spin awareness.

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REVIEW of NEW AOPA STALL/SPIN STUDY

Prepared by Rich Stowell

August 30, 2003

For the text of the AOPA study, see: http://www.aopa.org/asf/ntsb/stall_spin.html

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Although AOPA's recently published study, "Stall/spin: Entry point for crash and burn?" (hereafter referred to as "the AOPA study") provides some useful information, it certainly does not explode any stall/spin myths. In fact, the study's opening salvo, "Pilots who believe that aerobatic training will enable a recovery from an inadvertent spin in the traffic pattern are fooling themselves" is a myth I believe has been fabricated solely for the purpose of the study. Surely pilots who believe this--if any exist--must be part of a small minority indeed.

In the fifteen years that I've been involved in teaching pilots about stalls and spins, including giving over 170 safety seminars across the U.S., performing 24,000 spins, interacting with scores of other professional spin and aerobatic instructors, and reading everything I can get my hands on in this regard, I have yet to come across this so-called myth. I have yet to come across any pilot whose motivation to learn more about stall/spins was rooted in a belief that it would enable him/her to recover from a spin in the traffic pattern. I have yet to meet rational proponents of spin training who claim spin training would allow a pilot to recover from a spin encountered in the traffic pattern. Pilots certainly are smart enough to realize that if a stall is allowed to progress into a spin at traffic pattern altitudes, the probability of survival is slim regardless of prior training. The primary reason proponents advocate, and pilots seek out, additional stall and spin training is--surprise!--spin prevention. The advertised objective of spin training is to



expand a pilot's knowledge, experience, and skill set to prevent an inadvertent spin departure in the first place.

Another myth cited in the AOPA study is “watch your airspeed, or you're going to stall this airplane!” The study claims that this myth is largely propagated by flight instructors, yet it does not address the reason why this might be so. This airspeed myth is deeply rooted in general aviation. It has been propagated not only by generations of under-trained and/or uninformed flight instructors, but also by aviation textbooks and aviation publications. Case in point: A popular and highly respected pilot/writer for a major aviation magazine (not AOPA Pilot) wrote, “Just don't let airspeed get below a safe value and stalls are not a problem.” This nonsensical recommendation appeared in print in the year 2002. As a point of clarification, I doubt you will find this myth advanced by those who specialize in spin and aerobatic training.

AOPA has been known to disseminate stall/spin mythology as well. Most recently for example, page 56 in the August 2003 issue of Pilot contains the following: “The FAA dropped the requirement to demonstrate spins for the private pilot certificate in 1949.... It seems many more pilots were killed in training than in nontraining (real) emergencies...”

The notion that mandatory spin training was rescinded in 1949 because “we were killing more pilots during spin training than the training was saving” is a myth. In the many research papers I've read on the subject from every decade of powered flight, I have yet to come across evidence substantiating this claim. The reasons why mandatory spin training for private pilots was deleted from the regulations in 1949 were spelled out in CAR Amendment 20-3, specifically:

“This amendment eliminates spins from the pilot certification requirement and, in lieu thereof, provides for dual flight instruction in the prevention of and recovery from power-on and power-off stalls entered from all normally anticipated flight attitudes. It is believed that the deletion of the spin requirement and the placing of greater emphasis upon the prevention of and recovery from stalls will result in greater air safety in two ways: (a) it will emphasize recognition of and recovery from stalls which, on the basis of available accident statistics, has proved to be the most dangerous maneuver to pilots; and (b) elimination of the required spin maneuver will act as an incentive for manufacturers to build, and operators of schools to use, spin-resistant or spin-proof aircraft.”

Neither of the two ways cited in CAR 20-3 for improving air safety mentions spin accidents during instructional spin training flights. In fact, cited reason (a) unequivocally states that the stall was the most dangerous maneuver for pilots--not intentional spins performed as part of required spin training. I believe it is reason (b), however, that gets to the true motivation behind the deletion of mandatory spin training--the FAA and airplane manufacturers (and no doubt those whose primary allegiance was to the manufacturers) struck a deal: In exchange for relaxing spin training and aircraft spin certification



requirements, manufacturers were to develop more spin resistant designs. Manufacturers have largely failed to live up to their end of the bargain.

Perpetuating the more-pilots-die-in-spin-training myth in this day and age completely, if not intentionally, ignores the facts about those schools and instructors dedicated to the professional conduct of broad-based stall/spin awareness education. Once again I cite the results of a survey taken of well-known aerobatic schools in 1997 ("well-known" subjectively meant those schools repeatedly listed in the International Aerobatic Club Directory of Aerobatic Schools, those frequently advertising in Sport Aerobatics magazine and other publications, those with printed course outlines and good word-of-mouth reputations, etc.). Twenty responses out of twenty-four surveys mailed were returned completed, representing the following cumulative experience:

1. The range of years engaged in formalized spin/aerobatic training: 5 to 29 years.
2. The estimated total number of hours of spin and aerobatic instruction given: over 135,000 hours.
3. The estimated number of dual instructional spins entered: over 250,000 spins. This figure represents nearly 12,000 vertical miles travelled while spinning with students.

All this exposure to stalls and spins while in a dual training environment, and yet the sum total of stall/spin accidents involving these schools during any phase of any instructional flight whose primary purpose was spin or aerobatic training was ZERO. Six years and no doubt many thousands of additional stall/spins since the survey, this record still stands.

It seems the well-established schools specializing in comprehensive stall/spin awareness training have a good handle on how to conduct such training safely. These schools and their instructors have been providing a relatively safe, useful service to the aviation community for a long time, but readers wouldn't know it when the myth continues to be spread by aviation organizations.

Perhaps I missed something in my research, but since the latest example of this myth appeared in Pilot, I hereby challenge AOPA to provide credible and properly cited references (or better yet, copies of the text) dated circa 1949 supporting the claim that mandatory spin training for private pilot applicants was deleted largely because of the spin accident rate associated with the spin training required prior to 1949.



PILOT GROUPS

The AOPA study also breaks down fatal stall/spin accidents by pilot certificate level. Student pilots as a group have the lowest stall/spin fatality rate with (4) percent, followed by the corps of ATP's with about (10) percent. Of interest is AOPA's conclusion that "it appears that ATP's are generally the most experienced and knowledgeable pilots, while students are under very close supervision to ensure their safety."

First, another look at the ATP group: An interesting study looked at 13,680 general aviation accidents for the period 1973-83. The accidents had the following in common: they involved general aviation, fixed-wing, single-engine airplanes flown for personal reasons only, limited to either 1 or 2 people on board. The accident mix included 461 ATP's, all with professional flying jobs. ATP's made up 7.5 percent of the total pilot population, yet they were involved in only 3.5 percent of all fatal and less than 3 percent of all non-fatal general aviation accidents. For the ATP, general aviation pleasure flying posed no greater risk of death than flying professionally for air carriers.

The ATP accidents typically did not involve alcohol, drug, or medication abuse. ATP accidents less often involved a lack of skill compared to private pilot accidents. However, overconfidence played a role in nearly 60 percent of the pilot-induced, ATP accidents (compared to 30 percent of pilot-induced, private pilot accidents). ATP's were also over-represented in pilot-induced accidents involving aerobatics: in all aerobatic accidents, 13.7 percent for ATP's versus 6.5 percent for private pilots; in fatal aerobatic accidents, 50 percent for ATP's versus around 20 percent for private pilots. And compared to private pilots, ATP's were more likely to engage in accident-causing aerobatics at an unsafe altitude.

The fatal stall/spin accident component for ATP's was equally revealing. During non-aerobatic phases of flight, stall/spins were responsible for 13 percent of the fatalities involving ATP's. During the aerobatic phase, though, an alarming 38 percent of fatal stall/spin accidents involved ATP's. Compared to the stall/spin fatality rate for general aviation as a whole, ATP's appear to be above average at avoiding fatal stall/spins when in the normal flight environment. However, ATP's were below average when in the aerobatic environment. The following considerations are likely driving this discrepancy: overconfidence leading to unnecessary risk taking, inadequate aerobatic training, and/or lack of experience in-type.

Again, keep in mind that ATP's have trained to the highest skill level formally recognized by the FAA. Yet ATP's are still prone to the same human failings as other pilots. And in the aerobatic regime, deficiencies in judgment and stall/spin awareness skills are magnified regardless of the level of certification attained. Moreover, the fact that the best our group of "most experienced and knowledgeable pilots" can do is a 10



percent stall/spin fatality rate--two and a half times that of Student pilots--speaks volumes by itself.

STUDENT PILOTS & THEIR INSTRUCTORS

On now to Student pilots and the instructors who teach them: If the reason Student pilots have a 4 percent stall/spin fatality rate is due to “very close supervision to ensure their safety” as concluded in the AOPA study, then wouldn’t it follow that flight instructors would also have a comparably low stall/spin fatality rate? Well, the AOPA study notes that a “shocking” 91 percent of the fatal stall/spin accidents they analyzed occurred during dual instructional flights. According to another study, close to 20 percent of stall/spin accidents transpired during instructional phases of flight. And in 60 percent of those stall/spins, an FAA-certificated flight instructor was on board. Student pilots actually have a better stall/spin record when they are solo than when an instructor is with them. So what’s up with the instructors?

In 1993, the Transportation Research Record published a study conducted by Dr. Patrick Veillette entitled, “Re-Examination of Stall/Spin Prevention Training.” This flight-line study assessed, among other things, the stall/spin knowledge of general aviation flight instructors. Questionnaires were distributed to CFI’s at 43 flight schools in Tennessee, Mississippi, California, and Utah. Questionnaires were also handed out to instructors in attendance at seven FAA safety seminars and three Flight Instructor Refresher Clinics (FIRC’s). Five hundred thirteen civilian flight instructors and 28 designated flight examiners participated. Five aviation professionals--all flight instructors with college education in aerodynamics--processed the surveys. NASA research, journal literature, and the textbook, Aerodynamics for Naval Aviators were used as references.

This study at long last quantified the shortage of stall/spin expertise in our corps of FAA-certified flight instructors: Ninety-four percent of the instructors relied primarily on popular literature (i.e.: aviation magazines) for their stall/spin information; ninety-six percent also relied heavily on their own instructors. Unfortunately, ninety-five percent of the instructors failed ever to receive training in either spin dynamics or the likely conditions preceding an inadvertent spin. Ninety-four percent of the instructors understood neither aircraft spin certification requirements, nor the operating limitations imposed as a result.

The most foreboding aspect of the Veillette study, however, involved the hands-on spin experience of flight instructors. Ninety-eight percent noted that their formal spin training consisted of no ground instruction and a mere two spins--one in each direction. Nonetheless, these instructors readily received logbook endorsements certifying that they were competent to teach spins. We’d surely consider it absurd, for example, if all it took to qualify to be an instrument instructor (CFII) was a logbook entry showing that the applicant had performed a grand total of two instrument approaches. On the contrary,



instrument training has evolved into a rigorous process involving specially equipped airplanes and specially certified instructors. Just as the instrument flight environment places unique demands on its pilots and airplanes, so too does the spin environment place unique demands--aerodynamically, physiologically, psychologically--on those who enter its realm. It is equally unforgiving of incompetence as well. Yet too many pilots remain nonchalant in their attitudes toward spinning.

The changes made to FAR Part 61 in 1991 attempted to shore up our sub-standard stall/spin awareness across all levels of flight training, especially at the Flight Instructor Applicant level. But just how successful has this program been? More than a year after implementation of the enhanced stall/spin requirements, 97 percent of the CFI's surveyed were still unaware of the regulatory changes. In fact, 35 of the 513 instructors surveyed had been certified after the changes went into effect, yet not a single one of them was aware of the changes. Most instructors knew nothing about the FAA's well-written Advisory Circular AC 61-67B, Stall and Spin Awareness Training, issued on May 17, 1991 either.

The top-down effect of this continued ignorance was demonstrated during an informal survey of pilots attending stall/spin safety seminars in Minnesota, Florida, New Jersey, and California in 1998. On the order of 300 pilots attended these seminars, of which approximately 100 had earned Private, Commercial, or Flight Instructor certificates after April 1991. An abysmal 10 percent of these pilots had received a copy of AC 61-67B from their instructors as part of their stall/spin awareness training, even though applicable information in this circular superceded that of the FAA's old Flight Training Handbook (AC 61-21A).

The Veillette Study further identified a generally marginal understanding by CFI's of the following subjects: stall aerodynamics, the effects of control deflection on the stall, airfoil stall development, planform effects on stall behavior, spanwise flow effects, stall warning signs, the secondary effects of flight controls, and roll control at high angles of attack. Overall, respondents demonstrated an unsatisfactory understanding of these critical items: pro- and anti-spin forces, autorotation, the effects of numerous variables on spinning, spin phases and spin modes, the effects of the controls on spin motion and recovery, and common student recovery errors and the effects on aircraft motion.

Although instructors and examiners rated their understanding of stall/spin dynamics as "excellent," survey results clearly indicate that those charged with the task of teaching and testing new pilots possess a marginal understanding of stall/spin phenomena themselves. As mentioned earlier, nearly 20 percent of stall/spin accidents transpired during instructional phases of flight. On the order of 60 percent of these stall/spins occurred with FAA-certificated flight instructors on board.

Student pilots should be forewarned that, compared to their solo training sorties, they are nearly twice as likely to have a stall/spin accident with the instructor in the airplane.



The relative stall/spin unawareness of flight instructors in general is clear and disturbing. Evidence of how deeply rooted this unawareness really is can be found in stall/spin accidents associated with aerobatics. The aerobatic environment, after all, demands the utmost in stall/spin awareness; deficiencies in a pilot's stall/spin skills are magnified here. For example, NTSB analyzed 105 aerobatics-related accidents during the period 1972-1974. Stalls and spins were cited as primary accident types in 49 of the cases--a 47 percent stall/spin accident rate. NTSB also noted that most of the stall/spins were unintentional and were related to the performance of other aerobatic maneuvers initiated at unsafe altitudes. But a number of the stall/spins were intentional. And they were started at altitudes from which recovery should have been possible. Following are NTSB's observations about the accidents stemming from the intentional stall/spins at altitude:

"persons involved in these types of accidents had some previous spin instruction, but their overall knowledge and proficiency in spins is believed to have been minimal.... they probably were not fully aware of all of the adverse spin characteristics that could be induced through improper use of the flight or power controls, or both, or of the essential need to use a precise technique...in order to optimize the recovery."

How did flight instructors fare within this accident population? Twenty-four out of the 105 aerobatic accidents involved commercial pilots with flight instructor certificates. The age ranges broke down thus: 11 instructors were under 30 years old; 10 of them were between 30 and 50 years old; 3 were over 50 years old. Eight of the instructors had logged over 3,000 hours total time; only 2 had logged fewer than 600 hours total time. As for time in type, 14 instructors had fewer than 300 hours in type, and 6 of those had fewer than 100 hours in type. Instructors made up 23 percent of the accident population, but they were involved in 39 percent of the spin accidents. And fifty-eight percent of the instructors who crashed during aerobatic flight did so in a spin.

Based on all of the above, it is highly unlikely that Student pilots have achieved their 4 percent stall/spin fatality rate because of "close supervision." So what, then, could possibly explain the low stall/spin fatality rate of Students? What is it about being a Student pilot that the rest of us aviators, regardless of our certificate level, need to know? I don't know the answer for sure, but I do have a hypothesis:

According to the FAA, pilots as a whole spend a mere six percent of their flight time in the critical phases associated with the traffic pattern: takeoff, initial climb, approach, and landing. These phases, however, account for a disproportionate fifty-seven percent of aviation accidents. But the traffic pattern happens also to be the domain of Student pilots--round and round they go, flight after flight, up and down, full stops, touch and go's, go-arounds, flaps, no flaps, turning, gliding, etc. Looking back in my own logbook, I averaged more than 4.1 landings per hour all the way through to my Private Pilot check ride.



Even though the stall/spin knowledge passed down from instructors to students is largely inadequate, Student pilots nonetheless spend a lot more of their flight time in and around the pattern than other pilots. Through sheer repetition, Students eventually get good, real good, at flying in the pattern. Perhaps it is the intimate familiarity Students develop with traffic pattern operations (read that: slow flight) that compensates for deficiencies in stall/spin and other flight experience.

The ratio of landings-per-hour for the non-Student pilot groups (Private through ATP) is probably far lower compared to the Student group. Upon earning the Private certificate, cross-country flying tends to become the new norm. Landings per hour--and along with it, slow flight proficiency--might drop to as little as 1 per hour, even less. In my case, over the 6,300 hours logged since being a Student pilot, my average has dropped to 2.3 landings per hour. Perhaps a better indicator of experience vis-à-vis stall/spin accidents might be the landings-per-hour ratio (maybe a study could be commissioned to investigate a possible link between traffic pattern stall/spin accident frequency and landings per hour or a similar parameter). If so, then Students undoubtedly would be the most experienced pilots in the environment where the majority of stall/spin accidents occur.

The fatal stall/spin accident rate of the Student pilot group is also interesting from an industrial accident prevention standpoint. Industrial accident prevention postulates that the “absolute zero” accident rate achievable is around 2 percent. In other words, 98 percent of all accidents are in some way preventable; only 2 percent of accidents absolutely cannot be prevented. The Student pilot group apparently has come very close to the theoretical minimum fatal stall/spin accident rate--way to go Students! Maybe the rest of us should strive to get ever closer to this ideal as well. Even ATP's are two and a half times worse than Students in this regard, and a factor of five greater than the theoretical minimum.

OTHER STALL/SPIN MYTHS

Phrases in the AOPA study such as, “Spins were deleted from the requirements for a private pilot certificate in June 1949, and the accident rate from spins has been decreasing ever since” and “since elimination of the spin requirement for private pilots, the incidence of stall/spin accidents has actually decreased substantially” promulgate another persistent stall/spin myth. This myth attempts to create a non-existent cause-and-effect relationship. First of all, we cannot compare stall/spin accident rates from the period before 1949 directly with current stall/spin data without first normalizing the numbers to the same standards. The art of accident investigation, and the accuracy with which accidents are assigned into various categories, is much better now than it was prior to 1949. Even the level of damage required for an event to be classified as an accident has been revised over the years. Depending on the era and the context, so-called stall/spin accident statistics could represent one of several groupings: stall, spin, spiral, and mush accidents lumped



together, stalls only, spins only, or only stalls and spins added together. Hence a face-value comparison of these stats does not yield any conclusive information.

Moreover, many variables have interacted to shape the general aviation landscape since 1949--improved airplane designs, changes in training and testing standards, improved training methodologies, etc. Any one of which, or combination of which, could have influenced stall/spin accident numbers for the better. Studies have been published addressing the cumulative effect of these and other variables on the stall/spin accident rate. The Society of Automotive Engineers (SAE) published the most notable of these studies in 1976, entitled, Statistical Analysis of General Aviation Stall Spin Accidents. Among other things, researcher Brent W. Silver looked at the stall/spin accident rate (meaning stalls plus spins and nothing else) for the period 1965-1973. Within the database analyzed were 13 airplane designs with type certificates issued prior to 1950. In addition, these 13 designs had at least 500 registered aircraft during the period covered by the study.

The fatal stalls-plus-spins accident rate for this subset of airplanes was 42 percent. Twenty-odd years following the deletion of mandatory spin training, the very same airplane designs that contributed to the purported 48 percent stall/spin accident rate between 1945 and 1948 had a comparably high stall/spin accident rate. And remember: the 48 percent rate recorded prior to 1949 probably included more than just the stall and spin accidents considered in the SAE study.

A look at kit plane accident statistics is equally revealing. One researcher examined NTSB records available on the Internet for fatal accidents involving experimental, amateur-built airplanes between 1983 and 1997 (excluding commercial aircraft, ultralights, and rotorcraft). A total of 701 fatal accidents occurred during this period. Based on available textual descriptions and probable causes, the researcher concluded that an unintentional stall or spin preceded ground impact in 45 percent of the fatal accident cases.

It can reasonably be concluded, therefore, that the deletion of spin training in 1949 had little if any discernible effect on the stall/spin accident rate. The most significant change in the stall/spin accident rate came about as a result of the influx of newer certificated designs introduced in the latter 1950's, throughout the 1960's, and into the 1970's. Another way to look at it is this: "spin training" as it was conducted prior to 1949 was no better or no worse a training strategy than the "stall avoidance" strategy that replaced it. Once flight lines became populated with the newer designs, the stall/spin accident rate declined. But just as flight lines today retain essentially the same look and feel as in the 1970's, so too has the stall/spin accident rate leveled off. The stall/spin accident rate has stagnated along with the make up of our flight lines. Yet the myth that attempts to link the deletion of private pilot spin training to an improved stall/spin accident rate persists.



STALLS & SPINS, APPLES & ORANGES

The discussion of altitude losses during stalls and spins referenced in the AOPA study lacks context; the information as provided, therefore, is misleading. Simply reporting that POH's list average altitude losses during stalls as between 100 and 350 feet, for example, is meaningless without stating the relevant caveats. Manufacturer-supplied altitude losses during stalls are based on the following:

1. Intentional stall tests;
2. Performed at altitude;
3. Conducted under ideal conditions;
4. Using airplanes finely tuned to exact factory specifications;
5. With FAA-DER Test Pilots at the controls;
6. Without emotional duress.

These conditions are nothing like the real-life conditions under which pilots are typically encountering inadvertent stalls. Even during intentional stall practice at altitude, I routinely witness certificated pilots who are not proficient in stalls losing as much as twice the manufacturer-listed numbers. Now imagine those same certificated pilots in a traffic pattern, under duress, accidentally stalling while banked in a turn. The altitude actually required for recovery under these realistic conditions is not "minimal" compared to the limited altitude available.

The study's reporting of altitude losses during a spin is equally misleading. It fails to provide the following context for those numbers:

1. The spins were intentional;
2. Conducted at altitude;
3. Entered from a wings-level attitude;
4. Performed by experienced Test Pilots;
5. With pro-spin control inputs applied and held for one full turn prior to applying spin recovery actions.

No doubt pilots who are not proficient in spins, but who attempt to duplicate a one-turn spin under the above conditions (in spins-approved airplanes) will typically lose more altitude than test pilots. But the study's implication is that any stall can be recovered in less altitude than any spin. This simply isn't true. All other things being equal, of course the pilot who reacts instantly and correctly to the onset of a stall will recover with more altitude to spare than the pilot who enters a spin, holds pro-spin controls for precisely one full rotation, and then initiates recovery actions. Conversely, the pilot who freezes on the controls for several seconds at the onset of a stall will lose more altitude than the pilot who initiates correct recovery actions instantly upon spin departure. Again, for a meaningful comparison, the conditions and assumptions must be stated clearly.



Although the intentional, one-turn spin might be included as part of a broader spin training program, it is merely one exercise used to develop a specific skill set, just as performing holding patterns, or S-turns across a road, or any other practice maneuver. Readers of the AOPA study, though, are left with the impression that pilots who learn how to perform a one-turn spin will apply what they've learned in an emergency as follows: "I'm spinning in the pattern...ok, wait for one full turn...start recovery now..." Does anyone really believe this to be the desired response fostered during spin training?

(As an interesting side bar, every time we watch Sean D. Tucker and Patty Wagstaff perform snap rolls, lomcevaks, and other tumbling maneuvers during their airshow routines, we are witnessing experienced pilots skillfully using their quick reflexes to enter and recover from accelerated stall/spins at traffic pattern altitudes. Pilots have recovered from accidental spins in the pattern as well. Perhaps the most famous pilot to do this is former X-15 test pilot Scott Crossfield, who as an instructor, recovered from a student-induced spin departure in the pattern. These certainly are the rare exceptions, and no one should be lulled into a false sense of security about the prospect of recovering from a spin at pattern altitude. Again, the point of spin training is to give pilots the depth of experience to avoid an inadvertent spin in the first place.)

THE TOMAHAWK REFERENCE

The AOPA Study brings the controversial Piper Tomahawk into the mix to illustrate how airplanes can vary in their stall/spin behavior. Tabling the ongoing debate about this particular airplane for now, the AOPA study concludes that "the Tomahawk is involved in proportionately more stall/spin accidents than comparable aircraft.... the PA38 must be flown precisely in accordance with the Pilot Operating Handbook and with instructors who are proficient in stalls and spin recovery in that aircraft..."

AOPA's own Safety Review: Piper Tomahawk PA-38-112 published in 1996 discusses this airplane in detail. The Safety Review also provides a suggested Training Course Outline (TCO) for pilots and instructors who might transition into a Tomahawk. The TCO includes four training blocks totaling at least four hours of ground instruction and 4.5 hours of flight instruction. Given the stall/spin focus of the current AOPA study and the admitted propensity for stall/spin accidents in the Tomahawk compared to other trainers, the recommended TCO dedicates surprisingly little flight time to stall practice. The TCO devotes absolutely no flight time to the practice of spins, even though the airplane is approved for intentional spins.

Here, too, the AOPA study misleads readers regarding so-called significant differences between Tomahawk and Cessna 150/152 spin behavior. Representative POH's for both airplanes state:



Tomahawk: "The ailerons must remain neutral throughout the spin and recovery because aileron application may alter spin characteristics..."

Cessna 152: "Careful attention should be taken to assure that the aileron control is neutral during all phases of the spin because any aileron deflection in the direction of the spin may alter the spin characteristics..."

Tomahawk: "Apply and maintain full rudder opposite the direction of rotation."

Cessna 152: "Apply and hold full rudder opposite to the direction of rotation."

Tomahawk: "As the rudder hits the stop, rapidly move the control wheel full forward and be ready to relax the forward pressure as the stall is broken.... In all spin recoveries, the control column should be moved forward briskly, continuing to the forward stop if necessary.... in most cases, spin recovery will occur before the control wheel reaches the fully forward position."

Cessna 152: "Just after the rudder reaches the stop, move the control wheel briskly forward far enough to break the stall. Full down elevator may be required..."

Tomahawk: "Normal recoveries may take up to 1-1/2 turns when proper technique is used..."

Cessna 152: "Up to 2 turns [in a spin].... Application of recovery controls will produce prompt recoveries of from 1/4 to 1/2 of a turn. If the spin is continued beyond the 2- to 3-turn range.... [recoveries] may take up to a full turn or more."

Pilots reading the manufacturer-supplied information for these two designs clearly see that both the Tomahawk and the 152 should behave quite similarly within their approved spin envelopes. Why the Tomahawk may not behave as advertised, certified, and expected is an issue for another time.

RECOMMENDED DO's & DON'Ts

I agree with and endorse most of the Do's and Don'ts suggested in the AOPA study, with the following exceptions:

1. A glaring omission on the DO list should be the recommendation to procure a copy of FAA AC 61-67C, Stall and Spin Awareness Training coupled with the insistence that the appropriate training elements described in that AC must be covered thoroughly by your flight instructor as part of your training. Consider insisting on a review of these stall/spin awareness elements during every flight review as well.

The least we should do is demand--and strongly--that pilots receive the minimum stall/spin awareness training mandated since 1991. We should also demand of our Flight Instructor Applicants far more practical spin experience than the usual two intentional spin entries before being signed off as competent to teach stall/spin awareness to others.



And we should encourage pilots to consider enrolling in a stall/spin program that includes hands-on experience with spins in a controlled, dual environment, with qualified spin instructors.

2. AOPA's suggestion, "DON'T exceed 30 degrees of bank in the traffic pattern" has been repeated often enough that it might as well be considered an aviation myth. The logical question is, "How come? What's different about a 30 degree bank at 300 feet AGL versus the same bank angle at 3,000 feet AGL?" The answer: nothing whatsoever, aerodynamically-speaking.

I believe arbitrarily restricting pilots to a specific maximum bank angle in the pattern without citing the underlying reasons might actually cause more pilots to skid their turns than the suggestion is supposed to prevent. Consider that pilots have an instinctive aversion to banking an airplane when close to the ground. Furthermore, they are admonished, "don't ever exceed 30 degrees of bank in the pattern." So what's the pilot who has overshoot the turn from base to final to do?

The safest response to an overshoot is usually to level the wings and execute a go-around. But the all-to-common reaction is this: "I've overshoot...I need to get back to the centerline...I can't exceed 30 degrees of bank, so I'll cheat the turn by applying some more rudder..."

Pilots would be better served by giving them legitimate options rather than unqualified limitations. If you've overshoot the turn from base to final, for example, here are a few options:

1. Level the wings and execute a go-around, then use better judgment and planning on the next approach; or,
2. Simply continue the turn as is, describing a teardrop back to the extended centerline. Maintain a constant bank angle and airspeed throughout. And use power as required to control your altitude during the turn; or,
3. Increase the bank angle to tighten the turn using a coordinated application of aileron to bank the airplane and sufficient rudder to cancel adverse yaw. Release rudder pressure once the new bank has been established. Be aware that if you elect to increase the bank angle, the stall speed will also increase; therefore, you may need to lower the nose simultaneously to stay comfortably ahead of the increasing stall speed. You have to be willing to lower the nose even though you are close to the ground. Use power as required to control your altitude profile (i.e.: rate of descent) throughout. If you are at all uncomfortable with increasing the bank angle AND lowering the nose to make this happen, DO NOT ATTEMPT TO TIGHTEN THE TURN. Choose options 1 or 2 instead.



DO NOT attempt to tighten a turn by applying additional rudder either, for the following reasons: The misapplied rudder input will cause the nose of the airplane to slice downward through the horizon in yaw. Close to the ground, the instinctive reaction to this movement will invariably be to pull the elevator control farther aft. This input will not correct the skid, but will cause airspeed to decay and angle of attack to increase. If you pull enough to induce a stall with excessive rudder applied, the airplane will have no choice but to depart into a spin with insufficient altitude for recovery.

WHAT PILOTS WANT & NEED

The tone set by the AOPA study seems to be out of synch with the real fears, needs, and desires of general aviation pilots. I also suspect that AOPA harbors an antiquated view of “spin training.” Although many may still believe that pilots who have performed one or two intentional spins are “spin trained,” nothing could be farther from the truth. Just as it would be illogical to consider a pilot who has done a holding pattern or two to be “instrument trained,” it is equally illogical to consider a pilot who has done an intentional spin or two “spin trained.”

Modern-day “spin training”--training provided by professionals well versed in the theory and practice of high angle of attack flight--is part of a continuum more accurately described now by the FAA as “stall/spin awareness training.” Unfortunately, the research conducted by Dr. Patrick Veillette revealed that pilots and instructors alike have not been receiving the minimum stall/spin awareness training mandated since 1991 and spelled out in Advisory Circulars 61-67B and 61-67C. Using the Advisory Circular as a guide, the stall/spin awareness continuum progresses as follows:

Stall/spin effects and definitions; weight & balance considerations; airworthiness and certification standards; wing contamination effects; distractions, human factors, and vestibulo-ocular illusions; typical stall/spin accident scenarios and warning signs; stall recognition; types of stalls; stall recovery; secondary stalls; spins; primary causes; types of spins; spin recovery; typical recovery errors; spiral recovery.

The stall training branch includes stall avoidance practice at slow airspeeds; power-on stalls; engine failure while in a climb followed by a gliding turn; cross controlled stalls in gliding turns; power-off stalls; stalls during go-arounds; elevator trim stalls.

The spin training branch includes power-on and power-off stalls, turning stalls, spin avoidance training using realistic distractions; intentional incipient spins; spin entry, spin, and spin recovery; spin-to-spiral transitions; aggravated spins; inadvertent stall and spin departures from unusual attitudes.

The majority of pilots and instructors alike desire more and better information regarding stalls and spins. As the following surveys show, general aviation pilots historically have



not been opposed to the idea of hands-on spin training--not to be able to recover from a spin in the traffic pattern, but rather to expand their comfort levels as well as to develop additional awareness to prevent a stall/spin departure close to the ground:

I. General Aviation Pilot Stall Awareness Training Study, Report No. FAA-RD-77-26, September 1976, from an informal sampling of approximately (75) instructors attending a flight instructor refresher clinic:

Percentage believing spins should be required -- 65%

II. A Study to Determine Basic Aerobatics as a Requirement for the Commercial Pilot Certificate, Graduate Research Project by David Lee Bagby, Embry-Riddle Aeronautical University Extended Campus, Sky Harbor Resident Center, August 1997, from a survey of (49) instructors employed by ERAU:

“Spin awareness training is more effective than spin flight training” -- 82% either disagreed or strongly disagreed with this statement.

“I consider aerobic training [including spins] safe” -- 86% either agreed or strongly agreed with this statement.

“Aerobic training [including spins] would benefit my flying skills” -- 98% either agreed or strongly agreed with this statement.

“Aerobic training [including spins] would increase confidence in my flying ability” -- 98% either agreed or strongly agreed with this statement.

“Aerobic training [including spins] would improve safety” -- 96% either agreed or strongly agreed with this statement.

“Basic aerobic training [including spins] should be mandated into commercial pilot training” -- 82% either agreed or strongly agreed with this statement.

III. AVweb’s Question of the Week: Spin Training. [Online] Available <http://www.avweb.com>, downloaded January 25, 2001:

“What, if any, benefits did you get if you received spin training?” -- 956 responses

- a. Increased knowledge of what an airplane can and cannot do. (6%)
- b. Increased confidence in my skills. (5%)
- c. Increased awareness of the need for precision during critical phases of flight. (5%)
- d. All of the above. (82%)
- e. Other (3%)



“Do you feel spin training should be required to become a certificated pilot?” -- 1181 responses

- a. Yes. (57%)
- b. No. (7%)
- c. Encouraged, but not required. (36%)

Anecdotally, I've traversed the U.S. from Alaska to Florida, California to Massachusetts, averaging nearly a seminar a month every year for the last fifteen years. The majority of seminars have dealt with stalls and spins. The subject matter remains as popular among pilots today as it did fifteen years ago. My sense is that stall/spin articles appearing in aviation magazines continue to be well received by readers, too. And the demand for stall/spin training at established aerobatic schools is as strong as ever. The facts remain:

One-third of stall/spin accidents in an NTSB study involved pilots with more than 1,000 hours of flight time. The median pilot experience of those involved in stall/spins was 400 hours (just as many stall/spin victims had more than 400 hours as had less than 400 hours). We can profile who is most at risk of an accidental stall/spin as follows: it's the pilot who has logged fewer than 1,000 hours; who is on a daytime pleasure flight in good weather; who is in the traffic pattern; and who is either turning or climbing. Leading up to the inadvertent stall/spin, the pilot will be distracted into making a critical error in judgment. Fixation on the unfolding accident will effectively render (1) in (3) pilots deaf to a blaring stall warning horn. And pilots with fewer than either 500 hours total time, or 100 hours in type, are more likely to encounter an inadvertent stall/spin than to have a genuine engine failure (i.e.: a random-event engine failure, not one attributed to such pilot errors as fuel mismanagement).

And how does this compare, for instance, to the mid-air collision potential? Let's put the comparative threats into perspective: During the period 1977-1986, the number of mid-air collisions involving general aviation aircraft averaged 27 per year. Forty percent of these ended without injury. And those involved in mid-air accidents were typically high-time pilots, averaging slightly more than 3,000 hours.

Consider the following 1987 statistics as well: the U.S. boasted 699,653 active pilots who collectively logged an estimated 47.9 million flight hours. Amortized, U.S. pilots averaged 68 hours each that year (unfortunately, this average decreased to less than 50 hours per pilot per year during the 1990's). Consider, too, that the average active flying career of a general aviation pilot is estimated to be 17 years. Hence, the typical light airplane pilot will accumulate close to 1,200 hours total time. Pilots with 3,000 hours--those usually involved in mid-airst--are undoubtedly high time pilots by comparison. Once again we find that it is the majority of pilots--students, private pilots, CFI's--who remain squarely in the bull's-eye of the stall/spin accident zone throughout their aviation careers. Though important, mid-airst are statistically a lesser concern compared to the inadvertent stall/spin.



The stall/spin problem is neither insignificant nor indiscriminant. No segment of the pilot population is immune to it. Not CFI's, not even ATP's. Typical pilots on typical flights fit the typical stall/spin profile. Once encountered, the prospect for survival is bleak: one out of four fatalities tied to stall/spins, an 80 percent chance of serious or fatal injury, a greater than 90 percent chance that insufficient altitude exists in which to recover. Add to this the realization that 19 percent of stall/spin accidents are associated with the flight training process. And a CFI is present in 11 percent of the cases.

Those pushing the anti spin training agenda always attempt to measure the benefits of spin training against an unreasonable hypothesis, namely: "Even a spin trained pilot cannot recover a spin entered while in the pattern." To prove their case, opponents of spin training ask us to imagine an airplane in a spin a couple hundred feet above the ground. Next, a so-called spin trained pilot is miraculously transported into the cockpit to see if he/she can recover in time. This litmus test is disingenuous at best. Pilots don't suddenly wake up to find themselves spinning in the pattern. Stall/spin accidents do not occur in a vacuum. It is the pilot who, through an incomplete understanding of stall/spin dynamics and improper manipulation of the flight controls, actively participates to cause an airplane to stall and spin. Hence, the true test of the value of spin training should be, "how likely is a stall/spin aware and properly spin trained pilot to encounter an inadvertent spin departure in the traffic pattern?"

The FAA attempted to address this issue during their 1976 General Aviation Pilot Stall Awareness Training Study, Report No. FAA-RD-77-26. The bottom line: pilots who received better stall/spin awareness training--without hands-on spin training--were 1/3 less likely to progress into a spin after encountering an inadvertent stall. On the other hand, pilots who received better stall/spin awareness training AND exposure to intentional spins prevented spin departure following an inadvertent stall every single time. This FAA study, by the way, has driven all of the changes made to the training requirements regarding stall/spin awareness since 1976. Those who oppose spin training, or at least oppose further research into the possible benefits of such training, steer well clear of any reference to this FAA study.

The new AOPA study neither explodes stall/spin myths, nor makes the case against spin training. The study does, however, reinforce the critical importance stall/spin awareness and prevention must play if pilots are to avoid fatal stall/spin accidents in the pattern. If anything, genuine spin training should improve a pilot's ability to thwart spinning tendencies following an encounter with an accidental stall. Hands-on spin training, properly conducted, will leave no doubt in the pilot's mind that spin prevention is crucial when in the pattern. But equally important is the practical knowledge gained regarding the mechanisms behind spinning, the importance of adhering to published operating limitations, and the role misapplied control inputs play in inadvertent stall/spin departures.



Armed with solid information presented in the proper context, it's then up to every pilot-in-command to decide whether spin training should be part of their continuing aviation education.

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Guest Writer: Rich Stowell

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