ALASKAN AVIATION SAFETY FOUNDATION

April 2016

Perfect afternoon at the Takhinsha Mountains.

photo courtesy Steve Summers

The "Twelve Deadly Sins" of Aviation Accidents

By Harry Kieling, Chairman

In this newsletter I want to introduce a concept some of us have been talking about recently. Over the past several years of hosting Hangar Flying and evaluating accidents, I have heard from my guests cite the same causes and contributing factors. I have compiled those causes I kept hearing about to what I term the "Twelve Deadly Sins" There probably are more (but not many) or there may be others you would substitute. But I contend these will make any list. If you have any comments or additions please let me know.

What we want to do is highlight one of these for each future newsletter. This spring we will focus on high angle of attack and some associated hazards. Rocky Capozzi, AASF Board Member, experienced F-16, A-7 and GA pilot has put together a thorough and provoking discussion of that subject.

A couple of other items I want to mention. First, our Annual Seaplane Seminar will be held April 16 at UAA. Registration will begin at 8:00 and the seminar will go all day. What we want to do this year is really push to make the seminar available via the web to other locations around the state. We are working very hard on that and expect more details to follow.

The Safety Foundation has recently welcomed a couple of new corporate members who are involved with unmanned aircraft (Alaska Airborne Media and Worley Parsons.) Our feeling is Unmanned Aircraft are aircraft and share the same airspace and safety concerns as manned aircraft. Rather than stand on the sideline and watch this integration emerge we want to be an integral part of it. Welcome Unmanned Aircraft Operators.

The AASF List of the 12 Deadly Aviation Sins

1. Complacency
2. Lack of Proficiency and Stale Training
3. Flying from VMC into IMC (when VFR)
4. Exceeding critical angle of attack
5. Get Home-itis
6. Inadequate Personal Protective Equipment (PPE)
7. Poor or Non-Existent Risk Analysis
8. Poor or Non-Existent Crew Resource Management
9. Failure to obtain or heed a weather briefing and failure to file a Flight Plan.
10. Failure to complete a Weight and Balance or disregarding its results.
11. Flying with a dangerous/ debilitating medical condition
12. Flying under the influence of Alcohol or prescription/ nonprescription drugs.

Annual Seaplane Seminar

Saturday, April 16, 2016
UAA Aviation Facility on Merrill Field

Registration will start at 8 a.m. This is an all-day event, with lunch served by Alpha Eta Rho.

You can attend any or all of the seminars - attendance is free.

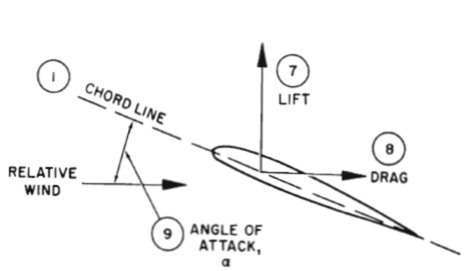
For more information, contact the AASF at (907) 243-7237 or aasfonline@gmail.com

Physics Is Very Reliable - Exceeding Critical AOA

By Rocky Capozzi

Exceeding the critical angle of attack recently made Chairman Kielings's list of twelve deadly sins. I suspect the collective "we" used words like stall or loss of control when we thought about aviation sins rather than exceeding the critical angle of attack. However, even if we don't often think in terms of angle of attack, a quick review of the term and its relationship to stall and loss of control is in order.

The angle of attack, or AOA, is defined as the angle between the "relative wind" and the "chord line" of your wing. Envision the relative wind as equal and opposite to your airplane's flight path through the air. The chord line is defined is a line that connects the leading edge of your wing to the trailing edge. It turns out that



the geometry of our airplane wing--its thickness, its curvature and its planform establish a unique relationship between its AOA and coefficient of lift, C_L. C_L has a straight line relation to AOA until shortly before C_L reaches its maximum value (C_{Lmax}). The critical angle of attack, or $\alpha_{crit,}$ is the AOA corresponding to C_{Lmax} -- about 20º in the graph pictured here. C_L drops dramatically once AOA exceeds α_{crit}. By definition, the wing is stalled at AOAs beyond α_{crit}. Notice there is no airspeed reference on this graph. Whether we are going slow or fast, if we "find a way" to raise our AOA beyond $\alpha_{crit,}$ we will stall.

The lift equation establishes the relationship between AOA (C_L) and velocity. $L = C_L \times q \times S$ is the simplest form of the equation. Lift, L, is equal to C_L times dynamic pressure, q, times the area of the wing, S. Dynamic pressure, q, is equal to one half the air density (symbolized by the Greek letter rho ρ), times the velocity (V) squared. Altogether we get $L = C_L \times (½ \times \rho \times V^2) \times S$. When we are in straight ahead, level flight our Lift equals our Weight. Therefore, C_{Lmax} dictates the minimum speed we can fly and still maintain level flight. That minimum speed corresponds to our one g, or wings level, stall speed. Things get slightly more complicated when we are in a banked turn.

When we bank our airplane, we tip our lift vector away from the vertical. To maintain level flight, the vertical component of lift must always equal our weight, W. The amount of lift required to maintain level flight at a bank angle of θ degrees is W/cosθ. The cosθ equals 1 with 0º bank and 0 at 90º of bank. Therefore the load factor, LF or "g" load, is 1 at 0º bank and infinity at 90º of bank. Here are some useful bank angle / load factor relationships: 30º/LF=1.15, 45º/LF=1.41, 60º/LF=2. Returning to the lift equation, $L = C_L \times (½ \times \rho \times V^2) \times S$, we see the pilot's only means of increasing lift is to increase C_L or increase airspeed. If a pilot begins a turn from wings level flight at or very near $C_{Lmax,}$ he can't increase C_L any further without stalling. Furthermore, as the bank angle increases, progressively more speed will be required to keep from stalling or sinking.

By now, you may be asking yourself, "Where is this aerodynamic dissertation going?" The most dangerous stall is the low altitude stall and it often results from low altitude maneuvering to observe something of interest. Can you say, "moose stall?" It's the moth effect—the moth is attracted to the flame and the pilot is attracted to the moose. The pilot's focus is outside the cockpit on or near the ground. Airspeed is not in the cross check. As the turn tightens up, more and more lift is required to maintain level flight. If the pilot allows airspeed to bleed off while continuously increasing AOA in an attempt to maintain level flight, it won't take long to exceed α_{crit} and stall. If nothing else, physics is reliable.

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Another bad thing happening as we approach α_{crit}. Induced drag, or drag due to lift, increases in proportion to the square of the coefficient of lift. This means the airplane will demand ever increasing amounts of power to keep from bleeding off airspeed as we approach α_{crit}. We are on the backside of the power curve and require more and more power to enable us to fly slower.

One of the signs you are approaching α_{crit} and the stall include a "mushiness" in control response. The airplane doesn't respond as quickly as usual to your flight control inputs. You may sense a settling of the airplane or, worse yet, you may allow the airplane to settle without realizing it. Shortly after control mushiness sets in the plane may exhibit light buffeting. That's a clear warning sign to relieve control pressure while simultaneously advancing the throttle. If a wing begins to drop remember to use your rudder to help level it as you simultaneously unload and increase power. Throwing in a big handful or aileron without coordinated rudder will aggravate your condition by creating adverse yaw and additional drag. Needless to say, if the nose slices or suddenly drops, you found a way to exceed α_{crit} and are now stalled.

Fundamentally, there's only one way to break a stall and that is to reduce the AOA below α_{crit}. The three steps to recovery are to unload while simultaneously leveling the wings and advancing your power. Unload to reduce your AOA below α_{crit}. This may only require relieving the back-pressure but may require forward stick pressure. Every airplane is different. Simultaneously advance power while using coordinated rudder and aileron to level the wings and counteract the left turning tendency induced by high power settings at high AOA / low airspeed. The altitude lost will depend on the severity of the stall, your nose position at the beginning of the stall sequence and your proficiency in stall recovery.

If it's been a while since you've practiced slow flight and stall recover, spend an hour with a CFI. Refresh your memory of the way the controls feel just prior to the stall and work on perfecting the recovery sequence. Always keep your airspeed in your cross check, particularly when maneuvering at low altitude. One last thought, if you are observing something on the ground from a relatively low altitude, consider using a higher altitude and "surround" the point of interest at a higher airspeed and slightly greater bank angle. If you encounter a stall under those conditions, you have two things going for you –you have more altitude to effect recovery and as soon as you unload the airplane you are at usable flying speed.

Safe journeys.

Rocky Capozzi, B.S., M.S., USAF (ret) is the Director of the UAA Aviation Technology Division.

The NTSB's "Most Wanted List" & Loss of Control

by John Mahany

In the March/April 2016 issue of the FAA's Safety Briefing, several articles directly address loss-of-control, in flight accidents (LoC). The NTSB's website prominently addresses LoC on their list of 'Most Wanted'. Under the headline, "Prevent Loss of Control in Flight in General Aviation," it states that over a six-year period, 47% of GA accidents in the US involved LoC, resulting in more than 1,200 fatalities.

The NTSB points out that GA pilot proficiency requirements are much less 'rigorous' than those of airline pilots. A typical GA pilot might go months on end, or longer, without flying. This is especially true during the winter season in cold, northern climates. If an airline pilot goes months without flying, his currency lapses and he is scheduled for time in a simulator to get the required landings, and stay current. (Not to mention regularly scheduled proficiency checks.)

The NTSB is concerned enough about this that they convened a forum in October 2015 to address LoC. The forum, "Humans and Hardware: Preventing General Aviation Inflight Loss of Control," addressed several of the common causes of LoC and proposed some recommendations.

Regular, ongoing pilot training is among the recommendations offered. You have to understand that for anyone who flies, whether for recreation or for hire, the training never ends. Just like with sports you have to practice, or 'train' regularly, to maintain proficiency with any activity. There is nothing new here. Piloting skills, like any skill-set, will deteriorate over time if not practiced regularly.

Stalls and stall characteristics need to be recognized, including the warning signs, so that prompt recovery techniques can be applied. Typically, many pilots don't practice stalls unless they participate in the FAA Wings Program, or have a Flight Review.

Included on the list of NTSB recommendations are –

- An honest assessment about one's knowledge level of stalls, and the ability to recognize and recover from one.
- Use of effective ADM (Aeronautical Decision Making) and flight risk assessment tools to use both before the flight as well as in flight.
- Better manage distractions (devices, technology) so they don't interfere with situational awareness
- Understand, properly train, and maintain currency in the equipment and airplanes they fly.
- Take advantage of available commercial trainer, type club, and transition training opportunities
- Realize that stall characteristics can vary with aircraft loading and are usually worse at aft CG

It is recommended that pilots consider installing an AOA indicator. This would help to improve and enhance one's situational awareness, especially during critical or high-workload phases of flight, when distractions can easily lead to a stall/spin accident.

To sum up, technology alone will not solve this. There is still a need for pilots to participate in regular, ongoing training, with a competent instructor, to maintain proficiency, and currency, in whatever aircraft type(s) they are flying.

Fly safely!

John Mahany has been flying for 30+ years. He is an ATP/CE-500 and an MCFI in southern California, with corporate, airline and charter experience. He spent 4 ½ years flying in Alaska. He is currently a King Air and Citation Instructor at FlightSafety International in Long Beach, CA. He flies a 1953 CE 180 for fun!

GA survey is underway & seeks your response

We need your help!

The General Aviation and Part 135 Activity Survey (GA Survey) for reporting on calendar year 2015 is underway! Because of the unique characteristics of the Alaskan region, all owners or operators of Alaska-based aircraft (as of December 31, 2015) will be asked to participate.

In addition to assessing the impact of safety initiatives, the FAA and other federal agencies use the GA Survey to understand how general aviation may be affected by other policy decisions. For example, the US EPA has used data from the GA Survey to examine how changes in fuel regulations, such as eliminating AvGas 100LL, may affect owners and operators and the services they provide. Accurate data from the 2015 GA Survey on the size and activity of the general aviation fleet in Alaska will continue to be an important source of information guiding such policies.

You can complete the survey online, or a survey form will be mailed to you along with a postage-paid envelope.

Previous years' survey results can be found here.

Why is your participation important?

- *We need your help so that we can accurately represent aviation activity in Alaska.* Data from this survey are used to estimate the number of active aircraft in Alaska and to understand the safe operation of aircraft.
- *We need to hear from everyone!* Please respond, even if you did not fly your aircraft during 2015, you sold it, or the aircraft was damaged.
- *Your responses are confidential.* Tetra Tech is an independent research firm that conducts the GA Survey on behalf of the FAA. The information will be used only for statistical purposes and will not be published or released in any form that would reveal an individual participant.

Questions? Please contact Tetra Tech toll-free at 1-800-826-1797 or email infoaviationsurvey@tetratech.com. Thank you!

Alaskan Aviation Safety Foundation

C/O Aviation Technology Division UAA
2811 Merrill Field Dr.
Anchorage, AK 99501

Phone: (907) 243-7237
Email: aasfonline@gmail.com

Chairman: Harry Kieling
Newsletter Editor: Colleen Mondor