NTSB

SAFETY ALERT

National Transportation Safety Board

★ Prevent Aerodynamic Stalls at Low Altitude ★

Avoid this often deadly scenario through timely recognition and appropriate responses

The problem

- While maneuvering an airplane at low altitude in visual meteorological conditions (VMC), many pilots fail to:
  - avoid conditions that lead to an aerodynamic stall,
  - recognize the warning signs of a stall onset, and
  - apply appropriate recovery techniques.
- Many stall accidents that occur in VMC result when a pilot is momentarily distracted from the primary task of flying, such as while maneuvering in the airport traffic pattern, during an emergency, or when fixating on ground objects.[1]
- Aerodynamic stall accidents fall into the "loss of control in flight" category, which is the most common defining event for fatal accidents in the personal flying sector of general aviation (GA).[2]

Related accidents

Sadly, the circumstances of each new accident are often remarkably similar to those of previous accidents. This suggests that some pilots are not taking advantage of the lessons learned from such tragedies that could help them avoid making the same mistakes. The following accident summaries[3] illustrate some common—and preventable—accident scenarios related to aerodynamic stalls:

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[1] See FAA Advisory Circular 61-67C, "Stall and Spin Awareness Training," the links to which are provided in the "Interested in More Information?" section of this safety alert.

[2] Each year, the NTSB investigates about 1,500 GA accidents in which about 475 people are killed. See the NTSB data for GA fatalities for calendar years 2007 – 2011. The defining events information is derived from the NTSB's Review of U.S. Civil Aviation Accidents, 2007-2009. Both data sources are available from the NTSB's Aviation Statistics web page at www.ntsb.gov/data/aviation_stats_2012.html.

[3] The accident reports for each accident referenced in this safety alert are accessible by NTSB accident number from the NTSB's Accident Database & Synopses web page at www.ntsb.gov/aviationquery/index.aspx. (The NTSB accident numbers are CEN12FA271, ANC11FA065, and CEN12CA294, respectively.) Each accident's public docket is accessible from the NTSB's Docket Management System web page at www.ntsb.gov/investigations/dms.html.

- A commercial pilot and a flight instructor were killed after executing a very steep, left, base-to-final turn in the airport traffic pattern in a Beech S35 airplane. The airplane subsequently descended to the ground in a manner consistent with a stall. Evidence indicates that the pilot likely overshot the extended runway centerline when turning to the final approach leg then applied excessive bank angle to correct the course.

- A commercial pilot was killed after his Piper PA-12 airplane lost engine power during takeoff. When the airplane was about 200 to 300 feet above the ground, it turned to the left as if the pilot were attempting to return to the airstrip, then it pitched down abruptly and descended in a steep, nose-down attitude, consistent with a stall. The accident site was adjacent to a road and about 300 yards from a clear field, both of which were suitable potential landing areas.

- The pilot of an RV-6 experimental airplane was flying over a beach area while a friend watched from the ground. The pilot was on his third low-altitude pass when he initiated a "tight left turn" then felt what he described as a "bump/drop" as if the airplane's "left wing lost lift." The left wing dropped, and the airplane descended to the water below, consistent with a stall. The pilot, who sustained serious injuries, had about 15 hours total time in RV-6 airplanes.

What can pilots do?

- Be honest with yourself about your knowledge of stalls and your preparedness to recognize and handle a stall situation in your airplane. Seek training to ensure that you fully understand the stall phenomenon, including angle-of attack (AOA) concepts and how elements such as weight, center of gravity, turbulence, maneuvering loads, and other factors affect an airplane's stall characteristics.

- Remember that an aerodynamic stall can occur at <u>any airspeed</u>, at <u>any attitude</u>, and with <u>any engine power setting</u>.

- Remember that the stall airspeeds marked on the airspeed indicator (for example, the bottom of the green arc and the bottom of the white arc) typically represent *steady flight speeds at 1G* at the airplane's maximum gross weight in the specified configuration. Maneuvering loads and other factors can increase the airspeed at which the airplane will stall. For example, increasing bank angle can increase stall speed exponentially. Check your airplane's handbook for information.

- Reducing AOA by lowering the airplane's nose at the first indication of a stall is the most important immediate response for stall avoidance and stall recovery.

- Manage distractions when maneuvering at low altitude so that they do not interfere with the primary task of flying.

- Resist the temptation to perform maneuvers in an effort to impress people, including passengers, other pilots, persons on the ground, or others via an onboard camera. "Showing off" can be a deadly distraction because it diverts your attention away from the primary task of safe flying.

- Understand that the stall characteristics of an unfamiliar airplane may differ substantially from those of airplanes with which you have more flight experience.

Interested in more information?

Education and training are essential to improving GA safety. The Federal Aviation Administration (FAA) Safety Team (FAASTeam) provides access to online training courses, seminars, and webinars as part of the FAA's "WINGS—Pilot Proficiency Program." The program includes targeted flight training designed to help pilots develop the knowledge and skills (including flight by reference to instruments) needed to achieve flight proficiency and to assess and mitigate the risks associated with the most common causes of accidents. The courses listed below and others (many of which were developed by the Aircraft Owners and Pilots Association [AOPA] Air Safety Institute, a division of AOPA Foundation), as well as seminar and webinar information, can be accessed from the FAASTeam website at www.faasafety.gov. (Course access requires login through an existing or creation of a free FAASTeam account.)

- Essential Aerodynamics: Stalls, Spins, and Safety
- Avoiding Loss of Control
- Maneuvering: Approach and Landing
- Positive Aircraft Control

Other resources:

- The AOPA Air Safety Institute offers several interactive courses, presentations, publications, and other safety resources that can be accessed from its website at www.aopa.org/asf/. (Course access requires creation of a free account.)

- "Airplane Flying Handbook" (FAA-H-8083-3A) provides guidance about stalls and spins (including accelerated maneuver stalls) in chapter 4 and discusses stalls in the airport traffic pattern in chapter 8. The handbook can be accessed from the FAA's website at www.faa.gov.

- "Stall and Spin Awareness Training" (FAA Advisory Circular [AC] 61-67C) and "Airmen Transition to Experimental or Unfamiliar Airplanes" (FAA AC 90-109) can be accessed from the FAA's Regulatory and Guidance Library web page at rgl.faa.gov.

- "Pilot's Handbook of Aeronautical Knowledge" (FAA-H-8083-25A) discusses aeronautical decision making and risk management in chapter 17. It provides basic risk management tools (including the "IMSAFE" health checklist, the "DECIDE" process for aeronautical decision making, the "PAVE" risk assessment checklist, and other tools). The handbook can be accessed from the FAA's website at www.faa.gov.

- A Personal Minimums Checklist can be accessed from the FAA's Guidance and Documents website at www.faa.gov/training_testing/training/fits/guidance/.

This NTSB safety alert and others can be accessed from the NTSB's Safety Alerts web page at www.ntsb.gov/safety/safety_alerts.html.