

CLIFF NOTES FOR AIRSHOW DEMONSTRATION PILOTS

By: Alan Armstrong*

INTRODUCTION

Airshow demonstration flying is a rewarding endeavor that requires mastery of the aircraft, situational awareness, and skill. This article is written as a primer for new airshow pilots and a review source for experienced airshow pilots. The scope of this article will be wide and will cover a number of diverse topics.

WHAT IS A CERTIFICATE OF WAIVER FOR AN AVIATION EVENT?

Because airshows involve performances where aircraft are operated in unusual attitudes and often at low altitudes, it is necessary for the provisions of the Federal Aviation Regulations to be waived in order to conduct the airshow. This is commonly referred to by pilots as a “waiver” or “certificate of waiver.” The FAA inspectors apply guidelines in issuing and administering certificates of waiver. These appear in FAA Notice N8900.526, Policy Updates for Issuing a Certificate of Waiver or Authorization Aviation Event (10/10/19) (hereinafter “the Notice”). Pilots performing in airshows should be familiar with the contents of the Notice. Provisions of the Notice differ from the standard Federal Aviation Regulations in terms of what constitutes aerobatic flight. Also, the Notice defines dynamic maneuvering and sets out the limitations for performers performing dynamic maneuvering solo, in formation, or in aerobatic displays. For example, aerobatic flight is defined in FAR Section 91.303 as “an intentional maneuver involving an abrupt change in the aircraft’s attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.” Further, FAR Section 91.307 that deals with when parachutes are required for flight operations describes aerobatic flight as “any intentional maneuver that exceeds (1) a bank of 60 degrees relative to the horizon; or (2) a nose-up or

*Alan Armstrong is an aviation attorney who practices law in Atlanta, Georgia. He appears in the Bar Register of Preeminent Lawyers Published by Martindale-Hubbell and is recognized in the 2024 edition of Georgia’s Super Lawyers. An Airline Transport Pilot, he flies a replica Nakajima Type 97 “Kate” Bomber on the Airshow Circuit and appears in television interviews concerning flight operations, air disasters, and aviation accidents.

nose-down attitude of 30 degrees relative to the horizon.” The Notice is more generous in defining aerobatic flight declaring that it involves a pitch attitude of greater than 60 degrees or a bank greater than 75 degrees. (Notice at A-5).

While aerobatic maneuvering will require will a Statement of Aerobatic Competency commonly called a SAC Card, if the pilot operates the aircraft with a pitch attitude of more than 60 degrees or a bank attitude of more than 75 degrees, dynamic maneuvering has its own definition in the Notice. According to the Notice, dynamic maneuvering may pertain to solo flight or formation flight. If the dynamic maneuvering is in solo flight, a SAC Card is required for abrupt maneuvering, crossing maneuvers and opposing maneuvers or when the pitch attitude exceeds 60 degrees or the bank attitude exceeds 90 degrees. A SAC Card will be required for formation flight if it involves formation separation, configuration or position changes, rejoins, crossing maneuvers, opposing maneuvers, or pitch angles greater than 60 degrees or bank angles more than 75 degrees. (Notice at A-7). Solo maneuvers after separating from a formation may be performed in accordance with the dynamic maneuvering solo limitations. For purposes of simplicity, the limitations of standard maneuvering solo, dynamic maneuvering solo, aerobatic maneuvering solo, standard maneuvering formation, dynamic maneuvering formation and aerobatic maneuvering are set forth in Appendix A to this article. The bottom line is that any aircraft can be operated in standard maneuvering solo operations with a pitch angle of less than 60 degrees and a bank angle of less than 75 degrees provided the aircraft is flown at least 100 feet above ground level and at an airspeed equal to or less than 300 knots indicated airspeed. Again, the reader is referred to the Appendix appended to this article setting forth the limitations for the six different flight configurations at airshows.

KNOW THE AIRPORT MARKINGS, THE AIRSPACE, CORNER MARKERS AND CROWD LINE

One of the challenges confronting airshow demonstrations pilots is they frequently arrive at a strange airport and perform in the airshow without a practice session to become acquainted with the runway markings, crowd line and corner markers. The corner markers are placed on either end of the crowd line to make certain that pilots do not penetrate the required separation from the crowd line. Category III provides for 500 feet of separation while Category II provides for 1,000 feet of separation,

and Category I provides for 1,500 feet of lateral separation of the crowd line. Sometimes the corner markers are well laid out and sometimes they are not. Hopefully before the first flight, the air boss has provided pilots with aerial depictions of the airport and the locations of the corner markers to ensure adequate separation between the performers and the crowd. Knowing the location of the corner markers is extremely important.

EMERGENCY PROCEDURES – ALWAYS HAVE AN OUT

Invariably, the air boss will review emergency procedures such as loss of radio communication or a distressed aircraft, a closed runway, or an abrupt shift in the wind. The pilot will also be acquainted by the air boss with alternate airports that surround the airshow environment where the pilot may divert in the event of an abnormal or emergency condition. Typically, the air boss will provide the pilots with a knee board attachment they may consult showing the magnetic orientation and distance of alternate airports. Before you fly, you should think about your best alternate in the event you cannot land at the airshow.

HAVE YOUR PAPERWORK IN ORDER

Perhaps there is nothing more distressing than a pilot who plans to fly at an airshow and suddenly discovers he does not have all of the paperwork to prove the aircraft is airworthy for his aircraft inspection by the FAA. This can result in the pilot becoming upset at a time he most requires his composure. To guard against this potential problem, a good pilot has all of his paperwork in a notebook with an index which is readily available for inspection by FAA personnel.

BRIEF THE PERFORMANCE AND FLY AS BRIEFED

In my experience, there frequently are three briefings. The first briefing is between the pilots and the air boss. The second briefing is amongst the pilots themselves. The third briefing is amongst the pilots and the pyrotechnic personnel. There are a lot of moving parts in an airshow performance, especially a performance that simulates air combat with multiple aircraft. For that reason, it is very important to be predictable by the other pilots. You should fly the flight you briefed and not do anything that is

unanticipated or unusual. Predictability is important for your fellow pilots and for yourself. You should be at your airplane 30 minutes before you fly and be strapped in 15 minutes before you fly at a minimum. Keeping track of the performers in the show is important, especially if a prior performer fails to fly or cuts his or her performance short.

BE WILLING TO ACCEPT CONSTRUCTIVE CRITICISM

While the vast majority of airshow performances are very safe, not every flight is perfect. There may be a missed radio call or a momentary miscommunication which can lead to temporary confusion. These kinds of problems will be the subject of a debrief following the flight. A pilot who accepts responsibility for his mistake can grow and become a better pilot. For that reason, the ability to accept constructive criticism is part of growing and maturing as a pilot.

SHOW APPRECIATION TO THE CROWD AND THE AIRSHOW SPONSOR

Those of us allowed to perform in airshows are allowed to do something that is extraordinary. Performing before thousands of people at an aviation event is both a challenging and rewarding activity. For that reason, after you have flown, it is courteous to walk the crowd line and shake the hands of the attendees and encourage the future generation to learn to fly and pursue an aviation career.

DO NOT PUSH THE FLIGHT HOME

After being on the road for a number of days and performing in an airshow with the physical and emotional challenges presented by that environment, it is important to set proper boundaries before departing for the trip home. If the weather is bad or you are tired, it may be desirable to wait a day before returning home. We all have pressures waiting for us back home both personal and professional. However, nothing is more important than getting home in one piece. Don't push it.

CONCLUSION

Performing in airshows is a coordinated, organic endeavor. It takes a lot of moving parts beginning with the airshow producers, the air boss, crash fire and rescue, your

fellow pilots, the ground boss and maintenance personnel. Hopefully some of the observations set forth in this article will assist airshow demonstration pilots in their safe performance in airshows.

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**PILOT'S KNEE BOARD SUMMARY OF PERMITTED MANEUVERS
IN FAA ORDER N8900.526 (OCT. 10, 2019)**

- Dynamic Maneuvering requires a SAC with a dynamic maneuvering endorsement and is defined as follows:
 - **SOLO:** Abrupt maneuvering, crossing maneuvers, and opposing maneuvers. Limitations: 60° Pitch / 90° Bank
 - **FORMATION:** Formation separation, formation configuration/position changes, rejoins, crossing maneuvers, and opposing maneuvers. Limitations: 60° Pitch / 75°Bank.
- Formation rejoins/separations/reconfigurations permitted inside the Performer's Box subject to the appropriate limitations.
- Performance Limitations in the Performer's Box:
 - (1) **Standard Maneuvering – Solo:** Limitations: Pitch 60° / Bank 75° / Altitude: 100' AGL / 300 KTS IAS
 - (2) **Dynamic Maneuvering – Solo:** Limitations: Pitch 60° / Bank 90° / Altitude 100' AGL / Airspeed: No Limitations (No Supersonic)
 - (3) **Aerobatic Maneuvering – Solo:** Limitations: Pitch: No Limitations / Bank: No Limitations / Altitude: No Limits / Airspeed: No Limits (No Supersonic)
 - (4) **Standard Maneuvering – Formation:** Limitations: Pitch 45° / Bank 60°, Altitude: 250' AGL / Airspeed 250 KTS IAS
 - (5) **Dynamic Maneuvering – Formation:** Limitations: 60° Pitch / 75° Bank Altitude: 250' AGL / Airspeed: No Limitations (No Supersonic)
 - (6) **Aerobatic Maneuvering – Formation:** Limitations: Pitch: No Limitations / Bank: No Limitations / Altitude 250' AGL / Airspeed: No Limitation (No Supersonic)

Prepared by: Alan Armstrong, Attorney/Pilot

alan@alanarmstronglaw.com

770-451-0313

APPENDIX A