



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 14, 1999

In reply refer to: A-99-1 and -2

Honorable Jane Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 6, 1997, at 6:35 p.m. local time, a North American T-6-SNJ5, N1047C, experienced a loss of control in flight while maneuvering near Woodward Field, Camden, South Carolina.¹ The airplane was operated by the Western North Carolina Air Museum under the provisions of Title 14 Code of Federal Regulations Part 91 and visual flight rules. Visual meteorological conditions prevailed at the time of the accident. The personal flight had originated at 6:20 p.m. from Woodward Field; the commercial pilot had not filed a flight plan. The pilot and his passenger were fatally injured, and the airplane was destroyed.

A friend of the pilot stated that the pilot was on the last flight of the day after giving rides in the airplane all day at an airshow. The pilot was taking the passenger for a ride to thank the passenger for his help throughout the day. According to the pilot's friend, the fuel tank had been refilled before a previous flight, and he estimated that the airplane had between 80 and 85 gallons of fuel on board.

Two witnesses in the area observed a low-flying airplane that was doing aerobatics, that is, steep turns, about 60° to 70° of bank. They heard the airplane engine "begin missing." The engine quit 10 seconds later. During this 10 seconds, the pilot remained in a left bank. According to the witnesses, after the airspeed deteriorated, the aircraft entered a right-hand spin.

According to Advisory Circular (AC) 91-48, "Acrobatics—Precision Flying With a Purpose," the Federal Aviation Administration (FAA) currently does not "require the performance of 'pure' acrobatics maneuvers during the flight test other than the spin requirement for airplane flight instructor applicants. Therefore, the FAA has not been involved in establishing criteria for the performance of acrobatic maneuvers" Federal Aviation Regulation (FAR) 91.303 defines acrobatic flight as "an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight." In AC 91-48, under discussion of the definition of acrobatic flight, the FAA notes the requirement that occupants wear parachutes for maneuvers exceeding a bank of 60° relative to the horizon or a nose-up or nose-down attitude of 30° relative to the horizon.

¹ NTSB accident No. ATL97FA134.

Regarding the medical condition of the pilot-in-command of the aircraft that crashed near Woodward Field, the pilot's medical records indicated severe coronary artery disease for which he was receiving medical treatment with diltiazem. The autopsy report noted the same disease, and scarring of his heart noted on the autopsy report further indicated that he had probably had a myocardial infarction (heart attack) at some time long before his accident. The FAA was aware of the pilot's condition, required that he receive special evaluation for it, and granted him an Authorization for Special Issuance of a third class medical certificate, but the FAA did not restrict his certificate in any way (other than a requirement for near vision correction).

The FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, completed a toxicological examination of specimens from the pilot on December 18, 1997. According to the report, the pilot tested positive for fluoxetine, norfluoxetine, cimetidine, and diltiazem. According to the 1998 *Physicians Desk Reference*, fluoxetine is a prescription antidepressant that can induce anxiety, drowsiness, nervousness, insomnia, and dizziness. The FAA does not permit an aviation medical examiner to issue a medical certificate to a pilot on mood-altering medications. Norfluoxetine is a metabolite of fluoxetine. Cimetidine (trade name Tagamet) is an antacid medication available over the counter. Diltiazem (trade name Cardizem) is a prescription medication often prescribed for patients with angina (chest pain due to blocked arteries in the heart). Possible side effects include low blood pressure and slowed heart rate, both of which would tend to reduce resistance to G-induced loss-of-consciousness (G-LOC). Cimetidine is known to significantly increase the blood levels of diltiazem when both medications are taken.

It is possible that the pilot's blood level of diltiazem increased as a result of the concomitant use of cimetidine, and that a relatively high-bank turn then resulted in enough acceleration (G-loading) to induce G-LOC and thereby incapacitate the pilot. The situation was greatly aggravated by the pilot's severe coronary artery disease, possibly resulting in incapacitation due to a sudden cardiac event.

The Safety Board has investigated two other accidents in which pilots with cardiac problems were fatally injured after performing aerobatics. On May 7, 1980, a pilot practicing aerobatic maneuvers in Olathe, Kansas, entered an uncontrolled descent and crashed. The Board determined the probable cause of the accident to be the pilot's preexisting heart condition, which made him more susceptible to the G-forces of aerobatic maneuvers.² On June 26, 1993, a pilot was performing aerobatics at an airshow in Concord, New Hampshire, when he entered a maneuver that, according to other aerobatic pilots, was unfamiliar to them. The Safety Board determined the probable cause of the accident to be the "loss of airplane control as the result of incapacitation."³ An autopsy revealed that the pilot had "severe atherosclerosis" and "an old . . . myocardial infarction scar." The only limitation on the pilot's medical certificate, however, was a requirement that the pilot use corrective lenses during flight.

² NTSB Brief of Accident MKC80FA034.

³ NTSB Brief of Accident NYC93FA127.

As a result of its investigation of the Olathe accident, the Safety Board recommended that the FAA issue an advisory circular detailing the physiological effects of G forces (Safety Recommendation A-81-48). In response, the FAA issued AC 91-61, "A Hazard in Aerobatics: Effects of G-Forces on Pilots." According to the AC, the most important biomedical factor in aerobatic flight is the pilot's response to acceleration (G-loading). The AC also states that G-tolerance depends on an individual's height, age, elasticity of blood vessels, training, the responses of the heart and blood vessels, and general health. Further, "a well tuned cardiovascular system seems to recover more rapidly from many different kinds of stress" and "low blood pressure . . . lower(s) G-tolerance."

Thousands of pilots receive special issuance certificates for heart-related problems each year. As an illustration of the numbers involved, three of the heart-related categories are for high blood pressure (which normally does not require special issuance), coronary bypass surgery, and myocardial infarction (heart attack). According to the Records and Correspondence Section of the FAA Aeromedical Certification Division, as of December 31, 1997, there were 28,981 medical certificates issued to pilots with high blood pressure that were being treated by medications: 3,339 first-class medical certificates; 6,155 second-class medical certificates; and 19,487 third-class medical certificates. Of the medical certificates issued to pilots who had undergone coronary bypass surgery, 164 were first class; 227 were second class; and 2,305 were third class. Of the medical certificates issued to pilots who had experienced a heart attack, 203 were first class; 214 were second class; and 2,099 were third class.

The condition of the heart and blood vessels is an important factor in a pilot's tolerance of aerobatic flight. Such flight increases the risk of G-LOC for pilots with a heart condition or who take medication that results in low blood pressure or low heart rate. Further, aerobatic flight also endangers the passengers of these pilots and the spectators at airshows, where aerobatic maneuvers are often performed, should the pilot experience G-LOC. The safety of these pilots, their passengers, and the spectators at airshows would be greatly increased by ensuring that the pilots who perform aerobatics can tolerate the unique physiological stresses such maneuvers put on their bodies.

FAR 67.401(d)(3) states that the Federal Air Surgeon may place on any special issuance medical certificate "any operational limitation needed for safety." Aviation Medical Examiners routinely enter limitations on medical certificates for pilots who require corrective lenses to meet applicable standards for visual acuity or who do not meet the color vision standard. The Safety Board believes that all pilots with special issuance certificates due to cardiac conditions that could affect their G-tolerance and all pilots taking medication that reduces G-tolerance should be restricted from engaging in aerobatic flight.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Restrict all pilots with special issuance certificates due to cardiac conditions that could affect their G-tolerance from engaging in aerobatic flight. (A-99-1)

Restrict all pilots taking medication that reduces G-tolerance from engaging in aerobatic flight. (A-99-2)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall
Chairman