Aviation Investigation Final Report

Location:	Sheridan, Indiana	**Accident Number:**	CHI02FA294
Date & Time:	September 25, 2002, 17:08 Local	**Registration:**	N116PS
Aircraft:	Aviat S-2C	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The Aviat Pitts S-2C was seen performing a tail slide when it fell backwards and entered an inverted spin from an altitude of about 2,500 feet above ground level. A witness stated that the airplane had been making smoke during aerobatics, but not during the tail slide. The airplane climbed to about 2,000 feet (AGL) and fell over on its back. He added, "There is no question that the aircraft was on its back." The airplane began spinning and turned 6 times before it appeared to begin to recover. He estimated that if the airplane had an additional 1,000 feet, it would have made a safe recovery. He also stated that there was engine noise. The front seat pilot had experience competing in aerobatic contests and the rear seat pilot was a certified flight instructor who provided aerobatic instruction to pilots in the accident airplane. Both pilots were equipped with emergency parachutes and were found with their restraint harnesses secured. The emergency parachute owner's manual states that pilots should know and rehearse their emergency procedures and mentally organize their bailout procedures. The airplane's canopy was with the wreckage and in the locked position. The flight originated in an over weight aft center of gravity configuration about 15 minutes before the accident. Examination of the flight control system and engine revealed no anomalies which would have precluded normal operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain adequate altitude and airspeed while performing an aerobatic maneuver. Contributing factors were the pilot-in-command exceeding the aircraft weight and balance, and his inadequate preflight planning/preparation.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. (C) AIRSPEED - INADEQUATE - PILOT IN COMMAND
2. STALL/SPIN - ENCOUNTERED - PILOT IN COMMAND
3. (C) ALTITUDE/CLEARANCE - INADEQUATE - PILOT IN COMMAND
4. (F) PREFLIGHT PLANNING/PREPARATION - INADEQUATE - PILOT IN COMMAND
5. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On September 25, 2002, at 1708 central daylight time, an Aviat Pitts S-2C, N116PS, operated by Fly Aerobatic, was destroyed on impact with terrain during an aerobatic flight near Sheridan, Indiana. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 local flight was not operating on a flight plan. The certified flight instructor (CFI) and private pilot were fatally injured. The flight originated from the Indianapolis Terry Airport (TYQ), Indianapolis, Indiana, about 1650.

Another CFI, employed at Fly Aerobatic, stated that the accident airplane had a usable fuel capacity of 23 gallons and would leave full on every flight. He heard the CFI ask for the fuel truck prior to the accident flight. He stated that he was friends with both pilots. He stated that he was flying in the area but did not witness the accident and estimated that the accident airplane was about 2,500 feet above ground level (AGL) performing a tail slide. He communicated a farewell to the CFI and turned towards TYQ as the accident airplane was in a vertical climb.

A witness stated that the airplane had been making smoke during aerobatics, but not during the tail slide. The airplane climbed to about 2,000 feet (AGL) and fell over on its back. He added, "There is no question that the aircraft was on its back." The airplane began spinning and turned 6 times before it appeared to begin to recover. He estimated that if the airplane had an additional 1,000 feet, it would have made a safe recovery. He also stated that there was engine noise.

A witness reported observing the airplane perform aerobatic maneuvers adjacent to the accident site for approximately five minutes prior to the accident. He stated that the airplane climbed to approximately 1,500 - 2,000 feet AGL in a "pure vertical maneuver" which ended in a tail slide. The airplane then fell backwards towards the ground for approximately 200 feet and began to spin inverted for approximately 6-10 turns. He stated that the "pilots were struggling with power trying to overcome the spin (stall)." He added that the airplane broke out of the "stall-spin."

PERSONNEL INFORMATION

The front seat pilot, age 48, held a private pilot certificate with a airplane single engine land rating issued on February 7, 1984. Copies of his pilot logbooks were provided to the National Transportation Safety Board by the attorney representing his estate. The last logbook page is dated from October 16, 1998 to June 17, 2001, with a page total of 14.2 hours and a previous page amount forwarded of 1,806.8 hours. The previous page is dated from June 1995 to May

20 (no year listed) with a page total of 23.8 hours. All of the entries on both of these pages were in aircraft listed as Pitts S1S and Pitts S2A. In June 16, 1995 and July 21, 1995, he competed in two aerobatic contests. The last logbook entry was the only entry listing a flight in the accident airplane during a local "aero" flight with the rear seat pilot. The flight duration was 3 hours. His last biennial flight review was on December 11, 1998, in a Pitts S-2B.

He was issued a third class medical certificate on February 6, 2001 with the following limitation; "must have available glasses for near vision." The pilot reported his weight to be 172 lbs on his airman medical certificate application.

The rear seat pilot, age 56, held a commercial pilot certificate with airplane single engine land and instrument airplane ratings. He was issued an initial CFI certificate with an airplane single engine rating on December 5, 2001, at a total flight time of 4,119 hours. Copies of his pilot logbooks were provided to the Safety Board by the attorney representing his estate. The last logbook page is dated from July 21, 2001 to September 7, 2001, with a page total of 93.1 hours. The previous page's amount forwarded and page total are 4,272.02 hours and 53.3 hours. On September 28, 2000, he recieved his last biennial flight review. On December 2, 2001, he last received an endorsement relating to Federal Aviation Regulation (FAR) 61.183(I). FAR 61.183 (I) is an endorsement indicating that the applicant is competent and possesses instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures after providing the applicant with flight training in those training areas in an airplane or glider, as appropriate, that is certificated for spins.

He was issued a second class medical certificate on December 21, 2001, with the following limitation: "holder shall wear lenses that correct for distant vision." The CFI reported his weight to be 230 lbs on his airman medical certificate application.

AIRCRAFT INFORMATION

The 1999 Aviat Aircraft Inc. Pitts S-2C, serial number (S/N) 6020, was a normal and aerobatic category two-place airplane powered by a 260-horsepower Lycoming AEIO-540-D4A5, S/N L-26723-48A, engine. The airplane and engine were last inspected during an annual inspection dated August 5, 2000, at a tachometer time of 283.9 hours. A smoke oil system was also installed at that time.

The S-2C has a total fuel capacity of 29 gallons (24 gallons at Fuselage Station (FS) 81.32 and 5 gallons at FS 81.75) or a total usable fuel capacity of 28 gallons.

The maximum certified weights in the normal and aerobatic category for the Pitts S-2C are 1,700 lbs. The S-2C has a length of 213 inches and center of gravity limits for both categories are as follows:

Forward: Fuselage station FS 86.35 at 1,475 lbs or less, with straight line variation to FS 88.5 at 1,700 lbs.

Aft: FS 90.20 at 1,700 lbs or less, with straight line variation to FS 90.5 at 1,625 lbs.

The airplane had a standard empty weight and center of gravity 1,268.4 lbs and 82.1 inches.

The Pitts S-2C Airplane Flight Manual lists the FS locations for the following:

Fuel Main 81.32 inches
Fuel Aux: 81.75 inches
Pilot Forward: 105.15 inches
Pilot Rear: 136.5 inches
Baggage: 157.81inches

WRECKAGE AND IMPACT INFORMATION

The airplane was resting upright in a corn field with all the wing and control surfaces attached to the fuselage. The airplane did not display any lateral bending or longitudinal displacement of the wings. There were undamaged corn stalks standing between the upper and lower wings of the airplane. The canopy was found lying next to the fuselage with the latching mechanism in the locked position.

Examination of the engine confirmed valve train continuity and thumb compression when the engine was rotated by hand. There were no metallic debris in the oil filter element. Disassembly of the engine driven fuel pump revealed no anomalies. Electrical continuity of both magnetos was confirmed.

Examination of the flight controls confirmed continuity from the control surfaces to each seat location.

No baggage or ballast was found in the aft baggage area.

The tachometer showed 333.2 hours.

MEDICAL AND PATHOLOGICAL

Autopsies of the pilot and CFI were performed at the Indiana University School of Medicine on September 26, 2002.

The Federal Aviation Administration’s Final Toxicology Fatal Accident Report of the pilot indicated 0.051 (ug/ml, ug/g) diphenhydramine was detected in blood and diphenhydramine was present in urine.

The Federal Aviation Administration’s Final Toxicology Fatal Accident Report of the CFI was negative for all substances tested.

SURVIVAL FACTORS

Both pilots had their restraints on and were equipped with Strong Enterprises Para-Cushion Seat Model 304 emergency parachutes. The Model 304 parachute has a weight with canopy of 17 lbs.

The owner's manual for the parachute states under System Function, "The total time for deployment and how far you travel from pulling the ripcord to a full open canopy depends very much on your airspeed. Generally, opening times are from 2 to 3 seconds and the distance fallen would be from 150 to 300 feet. This does NOT mean that you should plan on jumping or pulling at 300 feet." The manual additionally states under Using The Paracushion, Plan Ahead, "Know and rehearse you emergency procedures before they are needed to reduce your decision making time. With the parachute on, sit in your cockpit and fasten your lap and shoulder belts. Be certain these are over the parachute harness. Wear gloves, helmet and goggles, even headphones if you normally use them. Mentally organize your bailout procedure. Inspect your cockpit for projections or sharp edges that may damage the parachute, or injure you. Consider canopy ejection, oxygen disconnect, or other requirements that you may be faced with. All these things take time, and an emergency leaves you little time for rehearsal. Generally, you are better off staying with the ship if its controllable, but the time you spend evaluating that, reduces your margin of safety, and in some cases the condition can get worse. Make you decision quickly because all these actions consume altitude."

TESTS AND RESEARCH

Fuel records indicate that the airplane was refueled with 8.2 gallons of fuel.

Data retained in the nonvolatile memory of the airplane's fuel flow, fuel level and oil pressure/temperature instruments were down loaded. The fuel flow instrument indicated 20.6 gallons, the fuel level instrument indicated 18 gallons and time that electrical power was lost was 15 +/- 3 minutes.

The International Aerobatic Club, Chapter 11, compiled a synopsis of Pitts S-1 and S-2 accidents from 1983-2001. The highest percentage of accidents (37%) involved low-level aerobatics and the second highest percentage (32%) involved spins. One of the accident narratives states, "Interviews with other pilots, familiar with the flt characteristics of the Pitts, revealed that at a low state of fuel, the center-of-gravity is in the aft range. They reported a power reduction is necessary to recover from an inverted spin."

ADDITIONAL INFORMATION

The Federal Aviation Administration and Textron Lycoming were parties to the investigation.

The wreckage was released to the registered owner's insurance representative.

Pilot Information

Certificate:	Private	**Age:**	48,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	February 6, 2001
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:			

Flight instructor Information

Certificate:	Commercial	**Age:**	56,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	Yes
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Aviat	**Registration:**	N116PS
Model/Series:	S-2C	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Aerobatic; Normal	**Serial Number:**	6020
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	August 5, 2000 Annual	**Certified Max Gross Wt.:**	1700 lbs
Time Since Last Inspection:	283.9 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	49.3 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	AEIO-540-D4A5
Registered Owner:	Fly Aerobatic	**Rated Power:**	260 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	EYE,823 ft msl	**Distance from Accident Site:**	22 Nautical Miles
Observation Time:	16:53 Local	**Direction from Accident Site:**	185°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / 0 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	20°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.11 inches Hg	**Temperature/Dew Point:**	23°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Indianapolis, IN (TYQ)	**Type of Flight Plan Filed:**	None
Destination:	(TYQ)	**Type of Clearance:**	None
Departure Time:	16:50 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Indianapolis Terry Airport TYQ	**Runway Surface Type:**	Asphalt
Airport Elevation:	922 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36	**IFR Approach:**	Unknown
Runway Length/Width:	5500 ft / 100 ft	**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	40.13018,-86.21083(est)

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	Fredrick G Nardei; Federal Aviation Adminstration; Indianapolis, IN David C Moore; Textron Lycoming; Ardsley, PA
Original Publish Date:	November 25, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=55775