Aviation Investigation Final Report

Location:	Borrego Springs, California	**Accident Number:**	WPR10LA195
Date & Time:	April 8, 2010, 12:58 Local	**Registration:**	N28VS
Aircraft:	Snow ROCKET F1	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was practicing aerobatics in preparation for a local aerobatic competition. A witness on the ground observed the pilot's practice sessions as well as monitored his radio communications. The pilot flew into the designated aerobatic box and performed an aerobatic sequence twice. The pilot then performed a spin maneuver and departed the aerobatic box. The witness recalled that the pilot was requested to repeat a maneuver and reentered the aerobatic box at an altitude between 2,700 and 3,000 feet above ground level (agl). The airplane entered a 30- to 35-degree nose-down descent angle to begin his sequence. Shortly thereafter, the pilot made a radio transmission in the blind saying "I have no back stick." The witness estimated that the airplane was descending through about 1,800 to 2,000 feet agl when the witness heard someone ask the pilot if the airplane was under control. The pilot responded that it was not. A few seconds later, the witness heard another transmission telling the pilot to use the airplane’s trim; the pilot responded that "there is no trim" as the airplane was observed descending through about 600 feet agl. No further radio transmissions were heard from the pilot and the airplane continued to steepen its descent angle just before ground impact.

A postaccident examination revealed that the elevator flight control system exhibited numerous areas of separations consistent with overload from the rear control stick to the elevator control surface. The front and rear control sticks were found separated from their control columns. The interconnected control column, portions of the separated front and rear control sticks, elevator control servo, and portions of control rod were found to be fractured due to overstress. Examination of the front control stick revealed that it was fractured in overstress due to cantilever bending just above the control column fitting; the fracture initiated at a 0.22-inch diameter hole drilled into the front wall of the stick tube. The upper portion of the front control stick was not located. The chemical composition and hardness of the front and

rear control sticks were within specifications.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inability to maintain control due to the in-flight failure and separation of the pilot's flight control stick. The reason for the flight control stick failure could not be determined.

Findings

Aircraft	Control column section - Failure
Aircraft	Pitch control - Attain/maintain not possible

Factual Information

History of Flight

Maneuvering-aerobatics	Flight control sys malf/fail (Defining event)
Maneuvering-aerobatics	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On April 8, 2010, about 1258 Pacific daylight time, an experimental amateur built Snow Rocket F1, N28VS, was substantially damaged when it impacted terrain while maneuvering near Borrego Springs, California. The airplane was registered to and operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91. The private pilot, sole occupant of the airplane, was killed. Visual meteorological conditions prevailed and no flight plan was filed for the personal flight. The local flight originated from the Borrego Valley Airport (L08), Borrego Springs, about 1250.

Information provided by the International Aerobatic Club (IAC) Chapter 36, revealed that the pilot was scheduled to participate in the annual Borrego Hammerhead Roundup aerobatic competition. The IAC Chapter 36 representative stated that prior to event registration, pilot's were allotted a 10-minute practice session in the designated aerobatic area.

A witness located on the ramp of L08 reported that while working the aerobatic box, she first established radio contact with the pilot while he was in the primary holding area southeast of the airport. The pilot proceeded to fly into the designated aerobatic box and perform a sportsman sequence twice while receiving coaching from a person on the ground. He then performed a spin maneuver, which was followed by his departure of the aerobatic box to the north. The witness recalled that the pilot was requested to repeat the "goldfish figure" at which point she informed the pilot he had two minutes left on his allotted practice time. The pilot transmitted that he was going to reenter the aerobatic box from the west while traveling east. The witness informed the pilot to take his time, as he had plenty of time left within the aerobatic box and the pilot acknowledged.

The witness estimated that the airplane was at an altitude of between 2,700 and 3,000 feet above ground level (agl) when the pilot made a right turn to enter the aerobatic box. The witness said the airplane entered a 30-35 degree descent in order to obtain "speed/energy" to begin his maneuvers. Shortly after, the pilot transmitted in the blind "I have no back stick." The witness estimated that the airplane was descending through about 1,800 to 2,000 feet agl when the witness heard someone ask the pilot if the airplane was under control. The pilot responded "no, not at all." A few seconds later, the witness heard another transmission telling the pilot to "try your trim." The pilot responded "there is no trim" as the airplane was observed

descending through about 600 feet agl. No further radio transmissions were heard from the pilot. The witness further reported that the airplane continued to steepen its descent angle and gain airspeed prior to losing sight of it behind a sand dune.

Examination of the airplane by a Federal Aviation Administration (FAA) inspector revealed that the wreckage came to rest inverted in the open desert about one mile north east of L08. All major structural components of the airplane were located at the accident site. The fuselage was crushed aft and the engine was separated from the fuselage. The left and right wings remained attached to the fuselage and were crushed aft to the main spar throughout their respective spans. The wreckage was recovered to a secure location for further examination.

PERSONNEL INFORMATION

The pilot, age 58, held a private pilot certificate with an airplane single-engine land and instrument airplane ratings. An FAA third-class airman medical certificate was issued on March 10, 2010, with no limitations stated. The pilot reported on his most recent medical certificate application; that he had accumulated 2,100 total flight hours. Review of the pilot's personal logbook revealed that as of the most recent logbook entry dated April 4, 2010, the pilot had accumulated a total amount of flight time of 1,268.7 hours, of which 10.2 were within the preceding 30 days and 19.3 hours within the preceding 90 days of the accident.

AIRCRAFT INFORMATION

The two-seat, low-wing, fixed-gear airplane, serial number (S/N) 001, was built in 2008. It was powered by a Lycoming IO-540-EXP engine, serial number L-51474-04, rated at 340 horse power. The airplane was also equipped with a Whirlwind three-bladed adjustable pitch propeller. The airplane had two sets of controls, consisting of front and rear control sticks and two sets of rudder pedals. The two control sticks were interconnected via a torque tube assembly.

Review of the aircraft maintenance logbooks revealed that the most recent 100-hour inspection performed on the airplane was completed on December 18, 2009, at a tachometer time and airframe total time of 191.4 hours.

MEDICAL AND PATHOLOGICAL INFORMATION

The County of San Diego Medical Examiner conducted an autopsy on the pilot on April 9, 2010. The medical examiner determined that the cause of death was "multiple blunt force injuries."

The FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on the pilot. According to CAMI's report, volatiles, and drugs were tested with negative results.

TESTS AND RESEARCH

The wreckage was examined at the facilities of Aircraft Recovery Services, Pear Blossom, California, on April 28, 2010, by the National Transportation Safety Board investigator-in-charge. The examination of the airframe revealed that the elevator flight control system exhibited numerous areas of separations from the rear control stick to the elevator control surface. All areas of separations exhibited signatures consistent with overload. The front and rear control sticks were found separated from their control columns. The interconnected control column, portions of the separated front and rear control sticks, elevator control servo, and a portion of control rod were removed from the wreckage and subsequently sent to the NTSB Materials Laboratory, Washington, D.C. for further examination. The upper portion of the front control stick was not located.

An NTSB senior metallurgist reported that all fractures associated with these components were inspected using a 5X to 50X stereo zoom microscope. All fracture surfaces on the control column; and both flight control sticks were found to be due to overstress. The front control stick had a 0.22 inch diameter hole drilled in the forward side of the tube wall about 0.42 inch above the top of the stick socket. The overstress fracture initiated at the edges of this hole. The rear control stick had a 0.15 inch diameter hole drilled in the forward and aft sides of the tube wall (clearance holes to accommodate a mounting bolt) about 0.40 inch below the top of the stick socket. The overstress facture in the rear stick initiated at the edges of the forward hole.

The linkage fractures associated with the elevator control servo assembly were inspected using a 5X to 50X stereo zoom microscope. In all instances, the fractures were found to be consistent with a bending overstress. A control linkage that measured approximately 18 inches long and 0.5 inch in diameter had threaded ends. Both of the threaded end's fracture surfaces were consistent with bending overstress as indicated by inspection.

Examination of the front control stick revealed that it was fractured in overstress due to cantilever bending just above the control column fitting. Near the top of the front control stick, six 4-40 NC threaded holes were located within the tube. The threads appeared to be stripped within holes labeled one, four, and six. Hole number four exhibited a second untapped hole overlapping it. The top of the front control stick appeared to be saw-cut and hand filed.

According to a representative from Team Rocket LP, the control sticks were fabricated from aluminum alloy 6061 and tempered to the T6 condition. Examination of the front and rear control sticks revealed that the aluminum alloy composition and tube wall thickness were within specification limits. The hardness and conductivity measurements for both control sticks were found consistent with aluminum alloy 6061 in a T4 or a lower strength T6 condition.

Pilot Information

Certificate:	Private	**Age:**	58,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	March 10, 2010
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1268 hours (Total, all aircraft), 9 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Snow	**Registration:**	N28VS
Model/Series:	ROCKET F1	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	001
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	December 18, 2009 100 hour	**Certified Max Gross Wt.:**	2000 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	191 Hrs as of last inspection	**Engine Manufacturer:**	Experimental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-540
Registered Owner:	SNOW VAN E	**Rated Power:**	340 Horsepower
Operator:	SNOW VAN E	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	TRM,-115 ft msl	**Distance from Accident Site:**	23 Nautical Miles
Observation Time:	12:52 Local	**Direction from Accident Site:**	20°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	29°C / -9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Borrego Springs, CA	**Type of Flight Plan Filed:**	None
Destination:	Borrego Springs, CA (L08)	**Type of Clearance:**	None
Departure Time:	12:50 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	33.258888,-116.320831(est)

Administrative Information

Investigator In Charge (IIC):	Cawthra, Joshua
Additional Participating Persons:	Tyrone A Park; Federal Aviation Administration; San Diego, CA
Original Publish Date:	October 3, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=75693