Aviation Investigation Final Report

Location:	Chualar, California	**Accident Number:**	WPR11FA474
Date & Time:	September 29, 2011, 18:50 Local	**Registration:**	N42GP
Aircraft:	POE G L/POE S Y 540	**Aircraft Damage:**	Substantial
Defining Event:	Miscellaneous/other	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The owner/pilot of the experimental amateur-built aerobatic airplane was a part-time competition pilot, and he flew the airplane almost daily to practice aerobatics. His typical routine was to practice over his vineyards, located about 9 miles south of the airport where he based the airplane. On the day of the accident, the pilot took off, flew directly to his vineyard, and arrived there about 3 minutes later. He spent the next 4 minutes performing maneuvers, several of which could induce high g-loads. About 25 seconds after a steep climb and an equally steep descent and level-off, the pilot made a rapid course-reversal turn and began a loop, which terminated in ground impact. The airplane impacted in an approximate wings-level attitude, with high forward velocity and minimal vertical velocity. The debris path was aligned with the loop, and was nearly perpendicular to the vineyard trellis rows constructed of steel poles, steel wires/cables and nylon mesh. As a result, the airplane was highly fragmented. All major components of the engine and airplane, including all aerodynamic control surfaces, were accounted for at the accident site. A postaccident examination of the flight control system, airplane structure, propeller, and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The pilot's toxicology analysis identified the low-level presence of ethanol, likely as a result of ingestion. The detected level of ethanol was unlikely, in isolation, to have significantly impaired the pilot's performance, although there may have been some negative effect. The pilot also had a significant amount of hydrocodone in his blood, and the evidence indicated that he was a chronic user. Although hydrocodone is known to have an impairing effect on infrequent users, the effects on chronic users are less well-defined, and, therefore, the level of impairment due to the hydrocodone alone could not be determined. Similarly, the performance effects of the combination of alcohol and hydrocodone are not well defined, and although the pilot may have been impaired, the extent of his impairment could not be determined.

Significant coronary artery disease and a previous infarction put the pilot at risk for an acute cardiac event, including recurrent infarction and acute arrhythmia. The toxicology revealed the presence of

phendimetrazine, which, in combination with the pilot's history of hypertension, can significantly increase blood pressure, and may have exacerbated the risk of an acute cardiac arrhythmia.

The pilot had experienced g-induced loss of consciousness (g-LOC) during aerobatic maneuvers in the 3 months before the accident, but he did not report it to any medical personnel, and he did not cease aerobatic flying. Several of the maneuvers performed on the day of the accident could induce significant g-loads, and the sudden changes in cardiac work associated with g-loading and -unloading presented another risk factor for cardiac arrhythmia.

Therefore, the pilot's coronary artery disease, his previous infarction, his use of phendimetrazine, and his conduct of aerobatics all increased his risk of an acute cardiac arrhythmia. It is very likely that this pilot was medically incapacitated either by g-LOC alone, or in combination with an arrhythmia, and that this resulted in the ground impact. The investigation was unable to determine what effect the pilot's chronic opioid use had on either his pre-flight decision-making or his performance during the flight.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's incapacitation due either to g-induced loss of consciousness alone or in combination with a cardiac arrhythmia. Contributing to the accident was the pilot's use of several medications.

Findings

Personnel issues	Cardiovascular - Pilot
Personnel issues	Other loss of consciousness - Pilot
Personnel issues	Prescription medication - Pilot

Factual Information

History of Flight

Maneuvering-aerobatics	Miscellaneous/other (Defining event)

On September 29, 2011, about 1850 Pacific daylight time, an experimental amateur-built Zivko/Poe Edge 540 aerobatic airplane, N42GP, was substantially damaged when it impacted terrain in Chualar, California, while the pilot was conducting aerobatics. The certified private pilot/owner received fatal injuries. The personal flight was operated under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the flight.

The airplane was based at Salinas Airport (SNS), Salinas, California, and was one of several registered to the pilot. According to information provided by Lockheed Martin Flight Services (LMFS), the pilot did not contact them or the Direct User Automated Terminal System for weather or flight planning information.

Family members reported that the pilot frequently performed aerobatics in that airplane in the airspace over his vineyard property, which was located about 9 miles south of SNS. Flight track data recovered from a handheld GPS device that was onboard the airplane indicated that the airplane departed SNS about 1841, and headed directly for the vineyard. The airplane arrived over the vineyard about 3 minutes after departure. The pilot then spent the next 4 minutes performing maneuvers over the property. The GPS data showed that in the last 30 seconds, the airplane flew a straight, level trajectory to the east at an altitude of about 500 feet, and then began a steep climb. The last 3 recorded points indicated a climb rate of over 5,000 feet per minute, and that the airplane had nearly reversed course to the west, with only about 100 feet of lateral offset of the ground track. The last recorded point was at an altitude of 938 feet, and the calculated groundspeed was 40 knots. These characteristics are all consistent with the initial ascending portion of a loop or Cuban Eight. The last point was situated about 300 feet east of the initial ground impact point.

The airplane first impacted the dirt road adjacent to the vineyard trellises and plants, and then immediately entered the vineyard. The trajectory and debris path was offset about 75 degrees from the trellis rows, which were constructed of vertical steel poles, strung horizontally with steel wires/cables and nylon mesh. As a result, the airplane was highly fragmented. The debris path was aligned about 18 degrees from the azimuthal direction opposite that of the ground track of the immediately preceding ascending segment.

PERSONNEL INFORMATION

Federal Aviation Administration (FAA) records indicated that the 59-year-old pilot held a private pilot certificate with rotorcraft-helicopter, and single- and multi-engine land airplane ratings. His most recent flight review was completed in September 2009. In July 2009, he reported to the FAA that he had 1,500 total hours of flight experience, including 60 hours in the past 6 months.

He was a competition aerobatic pilot, and was actively involved in his family vineyard & wine-making business.

AIRCRAFT INFORMATION

FAA records indicated that the airplane was equipped with a Lycoming IO-540 series engine, and was first registered to the pilot's family in 2009. The airplane was purpose-designed for aerobatics. Although the airplane was emblazoned with advertisements for the use of ethanol in the fuel, the pilot's son reported that the pilot used normal avgas and did not use ethanol in the airplane.

METEOROLOGICAL INFORMATION

The 1853 automated weather observation at SNS included winds from 310 degrees at 9 knots, visibility 10 miles, an overcast cloud layer at 1,100 feet above ground level, temperature 18 degrees C, dew point 14 degrees C, and an altimeter setting of 29.92 inches of mercury.

The area around SNS and the accident location is subject to a cloud phenomenon called the marine layer, which typically moves in and out from the ocean on a daily cycle. The marine layer is characterized by a low ceiling, a relatively shallow cloud depth (typically about 1,000 feet or less) and usually fairly well-defined boundaries or edges. At the time of the accident, while SNS was affected by the marine layer, Monterey Peninsula airport (MRY) located about 19 miles west-northwest of the accident site, and much closer to the ocean than SNS, reported clear skies.

The GPS data showed that the pilot flew from SNS to his property at GPS altitudes between 700 and 1,000 feet, which were at least initially due to the marine layer affecting SNS. However, the investigation was unable to determine the sky conditions at the accident site.

WRECKAGE AND IMPACT INFORMATION

The initial impact point was evidenced by a ground scar on a dirt road that separated two planting areas in the vineyard. That ground scar measured about 20 feet long, and increased in width and depth along a magnetic heading of about 082 degrees. That scar terminated at a row of 3-inch-diameter metal posts, spaced about 8 feet apart, that supported the vineyard trellises. Two posts were fracture-separated near their bases, and three more were bent over in the direction of the debris path. The airplane was highly fragmented, and most of the wreckage was entangled in the vineyard trellises and grapevines.

The primary debris field extended approximately 160 feet beyond the initial impact point. The first two items in the debris field were a segment of fuselage structural tubing and a propeller blade tip. Virtually all of the wreckage was contained within this primary debris field. However, one magneto, the tailwheel, and an aileron balance weight were found about 500 feet beyond, and 150 feet above, the initial impact point.

All major components of the engine and airplane, including all aerodynamic control surfaces, were accounted for at the accident site. The propeller damage was consistent with propeller rotation under power. All 6 cylinders remained attached to the engine case, but most of the accessories and lines had been fracture-separated or torn from the engine. No catastrophic internal failures of the engine were observed. Flight control continuity was established to the maximum extent enabled by the severe

damage to the airplane. No flight control system, structural, propeller, or engine failures that either appeared to be, or that could be positively be, categorized as pre-impact were identified.

The ground scars and damage to the airplane were all consistent with the airplane striking the rising terrain with high forward velocity and low vertical velocity. Airplane attitude at impact was upright, approximately wings-level, with an approximately level pitch attitude.

An electronic acceleration display, an engine monitor, and a handheld GPS device were recovered from the wreckage and sent to the NTSB recorders laboratory in Washington, DC, for data download. Those results are discussed in a subsequent section of this report.

MEDICAL AND PATHOLOGICAL INFORMATION

The pilot's most recent FAA third-class medical certificate was issued in July 2011, with no waivers or limitations. On his application for that certificate, the pilot indicated that he did not have any reportable medical conditions, and that his only medication was 10mg daily of Crestor, which is used to treat elevated blood lipids and cholesterol.

The pilot had several DUI (driving under the influence of alcohol) convictions, the most recent of which was in 2004. He reported those events on his previous FAA medical certificate applications, except his most recent (July 2011) application. In 2006 the FAA granted the pilot's medical certificate with the provision that he maintain complete abstinence from alcohol.

In an interview with an FAA inspector, the pilot's son stated that in the 3 months prior to the accident, the pilot reported that he was "experiencing black-outs during high-G maneuvers while practicing aerobatics." This phenomenon is referred to as g-related loss of consciousness, or g-LOC. Despite these g-LOC events, the pilot did not report them to any medical personnel, and he did not cease aerobatic flying. The son stated that the pilot practiced aerobatics "almost daily," and that the pilot only performed aileron rolls and Cuban Eights, which are limited-g maneuvers. According to the NTSB Medical Officer, the sudden changes in cardiac work associated with g-loading and unloading could be another risk factor for cardiac arrhythmia.

The Monterey County Sheriff-Coroner's Office autopsy report indicated that the cause of death was "multiple blunt force injuries," and that "portions of heart reveal significant atherosclerotic disease with calcification and evidence of an old posterior wall myocardial infarction."

The FAA Civil Aeromedical Institute conducted forensic toxicology examinations on specimens from the pilot, and reported that ethanol was detected in the pilot's blood and tissue. In addition, the screening detected Hydrocodone, Losartan and Rosuvastatin in the blood and liver, and Phenmetrazine and Zolpidem in the liver tissue.

The ethanol tissue locations were consistent with ingestion, but the detected levels of ethanol were below the level associated with impairment.

Hydrocodone is prescribed as a controlled substance, and is found in drugs commonly marketed under the brand names Vicodin, Lortab, and Norco. The following US Food and Drug Administration warning is associated with the substance: "Hydrocodone may impair the mental and/or physical abilities required for the performance of potentially hazardous tasks such as driving a car or operating machinery. Alcohol

and other central nervous system depressants may produce an additive depression when taken with this combination product, and should be avoided." The effects of chronic, stable doses of hydrocodone on performance are not well -defined; some studies suggest persons using stable doses may not be significantly impaired in terms of automobile driving performance.

Losartan and Rosuvastatin are prescription medications used to treat elevated blood pressure (hypertension) and/or cholesterol. Phenmetrazine is no longer available in the US but is also the primary metabolite of phendimetrazine, an amphetamine analog that is prescribed as an appetite suppressant. None of these substances is associated with impairment. However, phendimetrazine can significantly increase blood pressure in patients with existing hypertension, and thereby exacerbate the risk of an acute cardiac arrhythmia.

ADDITIONAL INFORMATION

Flight Data Systems GT-50 Accelerometer

The airplane was equipped with a Flight Data Systems GT-50, which was a panel-mounted instrument equipped with an internal accelerometer. The device is capable of displaying accelerations, time, stopwatch, voltmeter, and outside air temperature. The GT-50 was not equipped with non-volatile memory, and therefore no data from the accident flight was available for download.

JPI EDM-730 Engine Monitor

The airplane was equipped with a J. P. Instruments EDM-730, which was a panel-mounted device that allows the pilot to monitor and record up to 24 parameters related to engine operation. Monitored engine parameters were a function of the specific installation. Engine data from the accident flight and two prior flights was recovered from the device. Examination of the data did not reveal any anomalies with engine operation or performance, and the engine was operating at the time of the last recorded data.

Garmin GPSMap 396

The airplane was equipped with a Garmin GPSMap 396 device, which recorded position, altitude, and time data for the flight. Data from the accident flight was recovered from the device, which enabled partial reconstruction of that flight. Since the GPS data did not contain any airplane attitude information, maneuvers such as aileron rolls could not be discriminated in the data.

As noted previously, once he arrived over his vineyard property, the pilot spent about 4 minutes performing aerobatic-like maneuvers. Those maneuvers included several rapid, small radius-turns and a steep pull-up/climb, followed by a similarly steep descent and level-off, which would induce higher-than-normal, and possibly significant, g-loads. About 25 seconds later, the pilot made a rapid course-reversal turn, and about 40 seconds later entered the loop which terminated in ground impact. Both the course-reversal turn and the loop could also induce higher-than-normal, and possibly significant, g-loads on the pilot.

Pilot Information

Certificate:	Private	**Age:**	59
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	July 15, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 17, 2009
Flight Time:	(Estimated) 1500 hours (Total, all aircraft), 300 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	POE G L/POE S Y	**Registration:**	N42GP
Model/Series:	540	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	0015
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	September 30, 2010 Annual	**Certified Max Gross Wt.:**	1800 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:		**Engine Model/Series:**	IO-540 SER
Registered Owner:	On file	**Rated Power:**	327 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	SNS,85 ft msl	**Distance from Accident Site:**	9 Nautical Miles
Observation Time:	18:53 Local	**Direction from Accident Site:**	360°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 1100 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	320°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	18°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Salinas, CA (SNS)	**Type of Flight Plan Filed:**	Unknown
Destination:	Salinas, CA (SNS)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

Airport Information

Airport:	Salinas SNS	**Runway Surface Type:**	
Airport Elevation:	85 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

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:**	36.569961,-121.439949(est)

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Jeffrey Ebey; FAA FSDO; San Jose, CA
Original Publish Date:	July 30, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=81931