Aviation Investigation Final Report

Location:	Ocean City, Maryland	**Accident Number:**	ERA13FA309
Date & Time:	June 30, 2013, 16:05 Local	**Registration:**	N116RL
Aircraft:	NANCHANG CHINA CJ-6A	**Aircraft Damage:**	Destroyed
Defining Event:	Aerodynamic stall/spin	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Witness accounts and on-board video recordings of the accident flight revealed that the pilot initiated and performed a series of aerobatic maneuvers with the airplane before initiating a stall, rolling the airplane inverted, and entering a steady-state spin to water contact. The airplane completed 22 revolutions in the spin, with the engine running smoothly, and the stick held fully aft. Examination of the wreckage revealed no evidence of any preimpact mechanical anomaly. Review of the pilot's flight records revealed no evidence of formal aerobatic training. However, the records indicated that he had conducted aerobatic maneuvers, including, on at least one occasion, a flat spin.

The on-board video recordings showed no signs of pilot distress or incapacitation and indicated that the pilot was actively engaged in controlling the airplane and was providing control inputs to maintain the spin to impact. There was no indication of any distracting event or of the pilot attempting to diagnose, troubleshoot, or respond to a perceived in-flight control, system, or engine anomaly. There were multiple cues available to the pilot that the maneuver should be terminated, including an increasing ground presence/perspective from the out-the-window view and the rapidly decreasing altitude indicated on the altimeter in the panel. However, the pilot failed to terminate the maneuver at an altitude adequate to prevent impacting the water. Therefore, it is most likely that the pilot lost situational awareness during the aerobatic maneuver/prolonged spin and did not recover from the spin before impact.

Given the fact that this was a sustained aerobatic maneuver, it is possible that the pilot lost situational awareness due to target fixation, a phenomenon that can occur at varying levels ranging from a breakdown in an instrument scan to failing to pull out of an aerial application run. In these cases, the pilot has cues that a response is required and has the knowledge and skills necessary to successfully perform the response. However, because of the narrowing of attention resulting from the goal-directed activity associated with this phenomenon, a loss of overall situational awareness occurs and the appropriate response is not commanded/input. The circumstances of this accident are consistent with the loss of situational awareness due to target fixation. The pilot appears to have focused on the

performance/sustainment of the spin maneuver and therefore misjudged or lost awareness of his exit altitude.

Probable Cause and Findings

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

The pilot's failure to terminate the intentional aerobatic spin at an altitude adequate to prevent impacting the water. Contributing to the accident was the pilot's loss of situational awareness due to target fixation during the prolonged aerobatic maneuver.

Findings

Personnel issues	Lack of action - Pilot
Personnel issues	Situational awareness - Pilot
Aircraft	Altitude - Not attained/maintained

Factual Information

History of Flight

Maneuvering-aerobatics	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On June 30, 2013, about 1605 eastern daylight time, a Nanchang China CJ-6A airplane, N116RL, was destroyed during a collision with water following a spiraling descent, just offshore from Ocean City, Maryland. The certificated private pilot/owner and one passenger were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight operated under the provisions of 14 Code of Federal Regulations Part 91. The local flight departed Ocean City Municipal Airport (OXB), at 1532.

The pilot and passenger were friends and fellow officers with the Ocean City Police Department (OCPD), and the purpose of the flight was a local pleasure/orientation flight for the passenger.

Several witnesses provided written and verbal statements to local law enforcement, and the statements were largely consistent throughout. Most described the airplane as it descended in a steady-state, nose down spin to water contact. Some described a "flat spin" as well as describing the landing as "flat… a belly flop."

In a telephone interview, one witness said he was familiar with the accident airplane, and had watched it fly over Ocean City and its beaches many times. About 15 minutes prior to the accident, he heard the airplane's distinctive engine sound, so he called his friends' attention to it. The witness watched one loop, and one barrel roll, and described the maneuvers as "slow," "lazy," and some distance from shore. He said the airplane flew out of his sight to the north after that, and didn't notice the airplane return near his location.

The witness then next noticed the airplane in a spiraling descent. He did not see the airplane depart controlled flight, and said he'd never seen the airplane fly close to shore before. He added, "He has never been that low, or that close to the shore." When asked about the sound of the engine, he said there was none. When asked if he thought the sound of boats operating close by could have drowned the engine out, he said no.

The witness stated that nothing departed the airplane during the descent, and he said he noticed that the canopy was still on the airplane throughout its descent. He described the airplane in a shallow, nose-down, spiraling descent, and added that the airplane's attitude was nearly flat. The airplane finally "pancaked" into the water with a slapping sound, "like your hand slapping against the water."

Pilot Information

Certificate:	Private	**Age:**	43
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	November 12, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	859 hours (Total, all aircraft), 231 hours (Total, this make and model), 0 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The pilot held a private pilot certificate with a rating for airplane single engine land. His most recent third class medical certificate was issued November 12, 2009.

Examination of the pilot's flight records revealed that he had recorded his flight experience in two logbooks, and then transitioned his recordkeeping to a computer-based spread sheet. Because of gaps, overlaps, and anecdotal evidence of flights taken after the last logged in the records, his total flight experience could not be reconciled.

The pilot first logged flights as a student pilot in 1996 and took extended breaks from flying before he was issued his private pilot certificate on October 5, 2007. His log book entries ended on June 30, 2011, however; his spreadsheet entries predate that, and his most recent entry was April 14, 2013 which was 2.5 months prior to the accident.

The pilot logged 859 total hours of flight experience, of which 231 were in the accident airplane make and model. All of the 231 hours in the accident airplane were annotated on the spreadsheet. In the remarks section the pilot annotated Formation and Safety Team (FAST) formation flight training. There were brief or one-word entries such as "practicing rolls," "roll," and on November 11, 2012, "flat spin" , but no dual instruction in aerobatic maneuvering was noted anywhere in the pilot's flight records.

In an email exchange with his insurance agent, the pilot stated that the 10 hours of dual instruction he received in the accident airplane as required by his policy was not performed by flight instructors. The response explained that exceptions were often granted for "warbirds" in order to meet the requirement. In the pilot's logbook, three pilots were noted as having provided "CJ training." Of the three, only one was a flight instructor. All three were interviewed, and each said that they only provided familiarization training to the pilot specific to his Nanchang China CJ-6A airplane. At no time did they provide aerobatic training to the pilot.

Aircraft and Owner/Operator Information

Aircraft Make:	NANCHANG CHINA	**Registration:**	N116RL
Model/Series:	CJ-6A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	3051222
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	April 2, 2013 Annual	**Certified Max Gross Wt.:**	3086 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3485 Hrs as of last inspection	**Engine Manufacturer:**	Housai
ELT:	Installed	**Engine Model/Series:**	H6A
Registered Owner:	CHANGAMAJIG CORP	**Rated Power:**	285 Horsepower
Operator:	Thomas J. Geoghegan	**Operating Certificate(s) Held:**	None

The airplane was manufactured in 1980 and registered in the experimental exhibition category. It was a two-place, tandem-seating, basic military trainer. Its most recent annual inspection was completed on April 2, 2013, at 3,485.3 total aircraft hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	OXB,11 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	16:20 Local	**Direction from Accident Site:**	30°
Lowest Cloud Condition:	Few / 600 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots / 17 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	200°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	25°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Ocean City, MD (OXB)	**Type of Flight Plan Filed:**	None
Destination:	Ocean City, MD (OXB)	**Type of Clearance:**	None
Departure Time:	15:32 Local	**Type of Airspace:**	

At 1621, the weather reported at OXB included few clouds at 600 feet, and the winds were from 200 degrees at 7 knots gusting to 17 knots.

Airport Information

Airport:	Ocean City Municipal OXB	**Runway Surface Type:**	
Airport Elevation:	11 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	38.434444,-75.040557(est)

Video footage as well as still photography revealed that the airplane appeared intact all the way to water contact. Sonar mapping and salvage divers revealed that the entire airplane rested together on the ocean floor, but was fractured in several places due to impact. The majority of the airplane was recovered on July 4, 2013. All major components were recovered with the exception of the left wing, and the vertical stabilizer.

Examination of the airplane revealed that the engine was still attached to the firewall, but the upper two engine mounts were fractured due to impact. The firewall-mounted oil tank was crushed. The underside of the fuselage was compressed due to impact with water (hydraulic deformation) and the fuselage was fractured between the fore and aft cockpit stations. The left wing was separated due to impact and was not recovered. Recovery personnel cut the right wing.

The empennage was fractured, torn, and separated from the fuselage due to impact, but remained attached by cables. Recovery personnel cut the cables to affect recovery. The vertical stabilizer was separated due to impact and was not recovered. The rudder, horizontal stabilizer, and the left-side elevator remained attached. The right-side horizontal stabilizer was cut to affect recovery, and the elevator was removed.

Control continuity was established from both cockpits, through cable, tube, and bellcrank cuts and breaks, to the flight control surfaces.

The engine was separated from the airplane, and was rotated by hand at the propeller. Continuity was established through the powertrain and valvetrain to the accessory section with one exception. The pushrod for the number 4 cylinder exhaust valve was displaced due to impact, and would not actuate the

rocker arm for valve movement.

The examination revealed no evidence of any pre-impact mechanical anomalies of the engine or airframe.

Medical and Pathological Information

The Office of the Chief Medical Examiner, State of Maryland, performed the autopsy on the pilot. The autopsy report indicated that each died as a result of "multiple injuries."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological testing of the pilot. The testing was negative for drugs, alcohol, and carbon monoxide.

Tests and Research

On July 8, 2014, two GoPro Hero self-contained video recorders and one Garmin Aera hand-held global positioning system (GPS) receiver were examined in the NTSB Recorders Laboratory in Washington, D.C.

The GPS receiver was damaged by impact and salt water immersion. Removal and download of the data chip revealed that no track data was recorded on the day of the accident.

The GoPro Hero video recorder was a high quality self-contained battery powered video and audio recorder. One camera was damaged and the flash memory card was wet from salt water immersion. The memory card was dried and data was recovered using the laboratory's file recovery software. The second camera was undamaged, and the memory card was downloaded normally.

The video recovered from the first memory card consisted of the entire accident flight from taxi, takeoff, enroute maneuvering and the start of the accident spin sequence. The portions of the accident flight captured by the second memory card consisted of the events that occurred just prior to the accident spin sequence through water impact. The angle of each video suggested that the first camera was mounted on the aft glareshield facing aft, and the second camera was hand-held by the passenger in the aft seat.

A Recorder Laboratory Specialist reviewed the video and prepared a transcript of the events from each camera. Video from the first camera revealed that after takeoff the airplane climbed to about 5,000 feet and performed a series of maneuvers that included barrel rolls, banks of 60 degrees, as well as positive and negative pitch angles of 80 degrees or more. The passenger was seen holding a GoPro camera facing forward, and rudder movement was evident throughout the flight.

Beginning about 1604:00, video from the second camera showed the airplane pitched up through 70 degrees, roll through 120 degrees of bank and eventually rolled inverted, before it entered a steady-state,

nose-down spin. The video showed the airplane stabilized in a 30-degree nose down attitude, wings level, the inclinometer (trim ball) displaced 1-2 ball widths to the right, and a 600 feet-per-minute rate of descent. As the airplane descended in the spin, the nosed-down pitch attitude decreased to about 20 degrees. The pilot's head was upright and faced forward, the control stick was fully aft, and the pedals moved somewhat, but remained generally neutral. The pilot and the airplane maintained this attitude through 22 complete revolutions before water contact at 1605:00. The pilot never released aft pressure on the control stick, and no evidence of remedial action was observed. The propeller was rotating and the engine sound was smooth and continuous without interruption all the way to water contact.

Additional Information

A friend of the pilot provided a written statement as well as video footage of flights he had taken with the accident pilot. The witness was not a pilot, but interested in taking lessons at some point in the future. He said that the accident pilot was not his instructor, but offered him advice with regards to study guides, practice tests, and map reading. During flights, he was given the flight controls, and allowed to practice navigation and steep turns.

The pilot would assist him in donning a parachute, and go over "bail-out" procedures prior to each flight. The flights would depart to the east over the water, and then turn north and travel between 5 and 30 miles to perform aerobatic flight "as a safety precaution to any one on the ground should something go wrong." He said that during the flights, the pilot would perform loops, rolls, and on one occasion, "went vertical and put the plane into a stall."

A review of the video footage provided by the witness revealed views from a wingtip-mounted camera pointed back towards the fuselage, as well as a rear-facing view from a camera mounted on the aft-cockpit glareshield. The footage showed the airplane operating at low altitude over the ocean, as well as climbs that penetrated clouds. The airplane would be surrounded, and the ground would be completely obscured by clouds, for several seconds. The aerobatic maneuvers were also as the witness described them. The vertical climb, stall, and spin entry captured in the video provided by the witness was consistent with the accident spin entry.

The airframe and powerplant mechanic who maintained the accident airplane was interviewed by telephone and provided a written statement. He held an airline transport pilot certificate, flight instructor certificate, and had approximately 14,000 hours of flight experience, with 1,300 hours in the accident airplane make and model. He provided instruction and a "check-out" in the accident airplane to the pilot/owner after it was purchased. The instructor did not provide any aerobatic instruction to the pilot/owner, and said he did not think any formal aerobatic training had been provided to him. When it was explained that there was video evidence of the pilot/owner performing aerobatics in the accident airplane during several flights previous to the accident flight he said, "If I had known that, I would have put a stop to it."

When asked about the stall/spin characteristics of the accident airplane, the instructor said that the

airplane had very predictable handling characteristics. The instructor stated, "You have to hold the airplane in a spin. The airplane will recover from a spin by itself. The second you release the stick, it will come out of the spin. The airplane will recover by itself from a fully developed spin in less than one turn. Once it is in the stall and spinning, you must hold the stick fully aft to maintain the spin." The instructor volunteered and stressed that "aerobatics over water is dangerous. It's disorienting."

Among the Federal Aviation Regulations that address aerobatic flight,
"…no person may operate an aircraft in aerobatic flight—
(b) Over an open air assembly of persons;
(e) Below an altitude of 1,500 feet above the surface."
According to U.S. Army Field Manual 3-04.301 (1-301) Aeromedical Training for Flight Personnel:
9-31. Fascination, or fixation, flying can be separated into two categories: task saturation and target fixation. Task saturation may occur during the accomplishment of simple tasks within the cockpit. Crew members may become so engrossed with a problem or task within the cockpit that they fail to properly scan outside the aircraft. Target fixation, commonly referred to as target hypnosis, occurs when an aircrew member ignores orientation cues and focuses his attention on his object or goal; for example, an attack pilot on a gunnery range becomes so intent on hitting the target that he forgets to fly the aircraft, resulting in the aircraft striking the ground, the target, or the shrapnel created by hitting the target.

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Jerry Pratt; FAA/FSDO; Baltimore, MD
Original Publish Date:	December 10, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87334