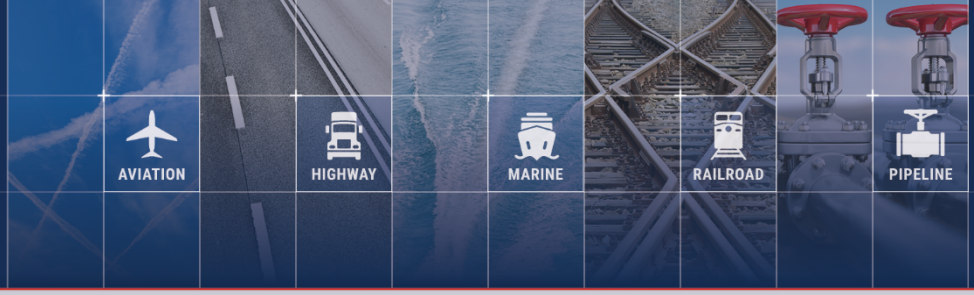

Aviation Investigation Factual Report

Location:	Key West, Florida	**Accident Number:**	ERA12FA193
Date & Time:	February 23, 2012, 20:36 Local	**Registration:**	N53589
Aircraft:	Cessna 172S	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

On February 23, 2012, about 2036 eastern standard time, a Cessna 172S, N53589, was substantially damaged when it impacted the waters of the Gulf of Mexico, following a loss of control during departure from Key West International Airport (EYW), Key West, Florida. The pilot and his pilot rated passenger were fatally injured. Dark night visual meteorological conditions prevailed, and no flight plan was filed for the personal flight conducted under Title 14 Code of Federal Regulations (CFR) Part 91, destined for Kendall-Tamiami Executive Airport (TMB), Miami Florida.

Earlier in the day, the pilot and his pilot rated passenger had departed South Bimini Airport (MYBS), South Bimini, Bahamas, for TMB. However, due to a visit to the Miami area by the President of the United States, a temporary flight restriction (TFR) was in effect and they were unable to continue to TMB, and diverted to EYW.

Witness Statements and Camera Imagery

Witness statements and review of airport security camera imagery revealed that the airplane arrived at EYW at approximately 1713 and then taxied to the general aviation ramp. The pilots were then directed to taxi to the international arrivals ramp at 1718. The pilots were cleared through customs at 1739, and then at 1741, the pilots taxied the airplane to the general aviation ramp.

Upon arriving at the general aviation ramp the airplane was refueled with 12 gallons of 100LL aviation gasoline. The pilots then requested a taxi cab so that they could have dinner and were driven to downtown Key West where they were dropped off on Duvall Street.

At 1842, the pilot called Lockheed Martin Flight Services and was connected with the Washington FAA Contract Flight Service Station (DCA FCFSS) and inquired as to when the TFR would end. The pilot

was then advised by the flight services specialist that it would end at 1945 but, to call back and check again with them in the event that it had been extended.

The pilot and pilot rated passenger were next observed exiting a taxi cab at the airport, and at 2015 the pilot rated passenger called the DCA FCFSS to inquire about the TFR. He was then advised that it was no longer in effect and was given an abbreviated briefing. Approximately nine minutes later, they entered the general aviation ramp and a red aircraft anti collision light beacon was seen to illuminate. Several minutes later the light moved in the direction of runway 09.

The airplane then took off. The airplane's flight path became "erratic" and the airplane descended, then leveled off, descended again and leveled off, and then was lost from camera view. Then a little while later, a witness who was fishing off the Boca Chica Bridge, observed "flashing lights from an airplane descending fast towards the water in a nose dive" and which "never seemed to pull up".

Review of Radar Data

A review of radar data provided by the United States Air Force 84th Radar Evaluation Squadron for the time period between 2000 and 2100 revealed that a flight track for a 1200 beacon code had been captured that was consistent with the parameters of the accident flight. No altitude encoding (Mode C) information was captured.

The radar picked up the beacon code while a target was on the runway at 2033:20. The target then departed EYW to the east, and then at 2033:50 at the end of runway 9 at EYW, the target turned to the north. Then at 2034:07, the average ground speed of the target increased from 72 knots to approximately 100 knots at the end of the flight track at 2036:05.

Pilot Information

Certificate:	Private	**Age:**	31
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	February 14, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	February 17, 2012
Flight Time:	(Estimated) 74 hours (Total, all aircraft), 74 hours (Total, this make and model), 30 hours (Pilot In Command, all aircraft), 8 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Other flight crew Information

Certificate:	Private	**Age:**	32
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	December 7, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 26, 2010
Flight Time:	(Estimated) 135 hours (Total, all aircraft), 135 hours (Total, this make and model), 100 hours (Pilot In Command, all aircraft)		

The pilot and pilot rated passenger were both Polish citizens. They both held Federal Aviation Administration (FAA) private pilot certificates with ratings for airplane single-engine land which were issued on the basis of their Polish private pilot licenses. Neither pilot possessed an instrument rating.

The Pilot

According to FAA records and records obtained from Dean International Inc., who rented the airplane to the pilot at TMB, the pilot was an air traffic controller in Poland. He received his FAA pilot certificate,

which required that all restrictions and limitations of his Polish private pilot license be complied with, on February 14, 2012.

His most recent FAA first-class medical certificate was issued on February 14, 2012. He had accrued approximately 74 total flight hours, 30 of which were as pilot in command.

The Pilot Rated Passenger

According to FAA records and records obtained from Dean International Inc. the pilot rated passenger received his FAA pilot certificate on December 7, 2009.

He had also previously rented from Dean International.

His most recent FAA third-class medical certificate was issued on December 7, 2009. He had accrued approximately 135 total flight hours, 100 of which were as pilot in command.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N53589
Model/Series:	172S	**Aircraft Category:**	Airplane
Year of Manufacture:	2003	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	172S9408
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	January 15, 2012 100 hour	**Certified Max Gross Wt.:**	2550 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	4624 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	IO-360-L2A
Registered Owner:	DEAN AND BLAYLOCK INC	**Rated Power:**	180 Horsepower
Operator:	Dean International Inc.	**Operating Certificate(s) Held:**	Pilot school (141)

The accident aircraft was a high wing, strut braced, four place, single engine airplane of conventional construction. It was powered by a 180 horsepower, four cylinder, fuel injected engine.

It was certificated for flight in instrument meteorological conditions (IMC) but unlike the airplane that the pilot did his rental checkout in which had an electronic flight information display system, the accident airplane was equipped with standard analog instruments. However, all of the flight instruments needed for flight in IMC were contained in a single panel located in front of the pilot.

These instruments were designed around the basic "T" configuration. The attitude indicator and directional indicator were located immediately in front of the pilot. They were arranged vertically over the control column with the attitude indicator in the upper portion of the panel and the directional indicator directly below it. Both indicators were air-driven by a vacuum system, which was powered by dual vacuum pumps equipped with check valves, to allow for normal vacuum system operation if one of the vacuum pumps should fail. The airspeed indicator was located to the left of the attitude indicator and, the altimeter was located to the right of the attitude indicator. A multi-function annunciator was also located above the altimeter and provided caution and warning messages for fuel quantity, oil pressure, low vacuum, and low voltage situations. No flight instruments were located in front of the pilot rated passenger.

According to FAA and airplane maintenance records, the accident airplane was manufactured in 2003. The airplane's most recent annual inspection was completed on January 15, 2012. At the time of accident, the airplane had accrued approximately 4,659.3 total hours of operation.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	EYW,3 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	20:53 Local	**Direction from Accident Site:**	225°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.01 inches Hg	**Temperature/Dew Point:**	23°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Key West, FL (EYW)	**Type of Flight Plan Filed:**	None
Destination:	Miami, FL (TMB)	**Type of Clearance:**	None
Departure Time:	20:33 Local	**Type of Airspace:**	

The recorded weather at EYW, approximately 3 nautical miles southwest of the accident site, at 2053, included: wind 100 degrees at 4 knots, visibility 10 miles; sky clear, temperature 23 degrees C, dew point 21 degrees C, and an altimeter setting of 30.01 inches of mercury.

According to the United States Naval Observatory on the day of the accident, sunset occurred at 1826, and the end of civil twilight occurred at 1849. The phase of the Moon was a waxing crescent with 3 percent of the Moon's visible disk illuminated. Moonset was at 2010.

Airport Information

Airport:	Key West International EYW	**Runway Surface Type:**	Asphalt
Airport Elevation:	3 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	09	**IFR Approach:**	None
Runway Length/Width:	4801 ft / 100 ft	**VFR Approach/Landing:**	None

Key West International Airport is located approximately 160 miles southwest of Miami on US highway 1. It is located on the last Key in the Florida Keys chain of islands, and is the southernmost airport in the continental United States. Artificial light sources (ground lights) are concentrated only on the chain of islands, since the area is surrounded by water.

According to the Airport Facility Directory, EYW had one runway oriented in a 09/27 configuration. Runway 09 was asphalt, grooved, and in good condition. The total length of the runway was 4,901 feet, and its width was 100 feet.

It was equipped with nonprecision runway markings, in good condition, medium intensity runway edge lights, and runway end identifier lights.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	24.602222,-81.750556

On February 24, 2012, at approximately 1235, floating debris was discovered on the waters of the Gulf of Mexico by a boater who notified the United States Coast Guard Group Key West (USCG). The USCG and Florida Fish and Wildlife Commission responded to the area and discovered the wreckage of

the airplane in the general vicinity of the floating debris, laying on the sea floor, in approximately 7 feet of water. The wreckage was then recovered and secured using local assets by the Monroe County Sheriff's Office and Florida Highway Patrol for examination by the NTSB.

Examination of the wreckage revealed no evidence of any preimpact failure of the airplane's structure. Examination of the wings revealed that the right wing had fragmented into multiple pieces which exhibited areas of crush and compression damage and the left wing had separated from its mounting location. The empennage also exhibited areas of crush and compression damage to its leading edges however, the horizontal stabilizers, elevators, vertical stabilizer, and rudder, had remained attached to their fittings. The left main landing gear had remained attached to its mounts but, the right main landing wheel assembly was separated from its mounting location. The nose landing gear assembly was also separated from its mounting location, the fuselage exhibited multiple areas of compression damage, and the engine had separated from its mounting location.

Examination of the flight controls did not reveal any evidence of preimpact failure or malfunction. The flight and trim control cables, runs, and associated hardware did not reveal any evidence of a preexisting jam. Control continuity was established for all flight controls

Examination of the cockpit revealed that the throttle control was in the full open position, the mixture control was in the full rich position, and the electric fuel pump switch was in the "ON" position, The pitot heat switch was in the "OFF" position, the flap indicator was in the "0°" (flaps up) position, and the fuel selector handle was impact damaged and was approximately in the "BOTH" fuel feed position.

Examination of the flight instruments revealed that the altimeter was missing its indicator hands. Its Kollsman window displayed 30.00 inches of mercury. The attitude indicator displayed an approximate 50 degree right wing down, and 22 degree nose down attitude. The directional indicator displayed a heading of 314 degrees and the heading bug indicated 215 degrees. Internal examination of both instruments revealed evidence of rotational scoring.

Examination of the pitot static system revealed that the pitot tube did not exhibit any evidence of preimpact blockage.

Examination of the propeller and engine revealed no evidence of any preimpact failures or malfunctions. The propeller remained attached to the propeller flange. Both propeller blades exhibited twisting, S-bending, leading edge gouging, and chord wise scratching, and the tip of one blade was missing. Oil was present in the rocker boxes and oil sump, and the oil sump screen was absent of debris. The number one cylinder push rods and housings were bent and the number two cylinder push rods were missing. Crankshaft and valve train continuity was confirmed and examination of the interior of the cylinders with a lighted borescope did not reveal evidence of any preimpact damage to the piston domes, cylinder walls, or valves. The spark plugs were corroded due to salt water immersion. The left magneto when rotated by hand produced spark at all towers. The right magneto was impact damaged and would not produce spark however, internal examination did not reveal any evidence of preimpact failure or malfunction. The upper vacuum pump was functional and its vanes were intact. The lower vacuum pump was impact damaged but when debris was removed it could be rotated by hand. The engine driven fuel pump when actuated by hand furnished suction and compression. The fuel injector servo was missing.

Medical and Pathological Information

Autopsies were performed on the pilot and pilot rated passenger by the State of Florida, District 16, Office of the Medical Examiner. Cause of both deaths was multiple blunt force wounds.

Toxicological testing of the pilot and pilot rated passenger was conducted at the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma.

The pilot's specimens were negative for carbon monoxide, cyanide, basic, acidic, and neutral drugs. A small amount of ethanol was present in the Kidney, Liver, and Heart, from sources other than ingestion.

The pilot rated passenger's specimens were negative for carbon monoxide, cyanide, basic, acidic, and neutral drugs.

Tests and Research

Flight Restrictions in the Proximity of the President

On the day of the accident, a TFR was in effect which would not allow the pilot to continue his flight from MYBS to TMB. According to the FAA, TFRs are used by the FAA to restrict aircraft operations within designated areas. Historically, TFRs had been used by air traffic management as a means of separating "non-participating" aircraft from those engaged in certain activities, such as firefighting, rescue, and law enforcement operations. They had also been used to keep aircraft away from surface-based hazards that could impact safety of flight, such as toxic gas spills or volcanic eruptions. However, TFRs, along with Air Defense Identification Zones (ADIZ) and Flight Restriction Zones (FRZ), have been widely used to restrict overflights through certain airspace for reasons of national security.

According to 14 CFR Section 91.141 Flight Restrictions in the Proximity of the President and Other Parties, TFRs issued under this part are used to protect the President, Vice President, or other public figures while traveling throughout the United States. Prior to September 11, 2001, such restrictions were very localized and rarely impacted general aviation pilots. However, ongoing security concerns led to restrictions much greater in size, forcing pilots to increase their awareness of Presidential movements. In many cases, Presidential TFRs with a 30 nautical mile radius or greater have been established and typically extend from the surface up to, but not including, flight level (FL) 180.

Rental Return

The pilot had rented the airplane on February 19, 2012 and wanted to keep the airplane until February 27, 2012 but, the airplane had been previously scheduled for maintenance, so the pilot had agreed to return it to Dean International Inc., on February 24, 2012.

Dean International

Dean International Inc. is headquartered at TMB and is one of the largest 14 CFR Part 141-approved flight schools in North America. In addition to providing training they also rent aircraft.

According to the president of the company, the pilots had been advised that they were not authorized to fly at night.

Review of Dean International Inc. records revealed that the pilot received a flight review and rental check out by a flight instructor on February 17, 2012 in a Cessna 172 equipped with a Garmin G-1000 electronic flight instrumentation system. Review of the "Check Out" sheet revealed that an "X" had been entered on the sheet next to "night operations", indicating that he had not been checked for night operations.

Review of the rental agreement also revealed that it required a "pilot certificate with necessary ratings as required by the FAA for the aircraft rented and use for which rented" and that the renter would not use the aircraft for "any use that is in violation of FAA regulations applicable to aerobatic flight, instrument flight, the operating limitations of the aircraft, minimum safe altitudes, night flying, student instruction, or pilot certificates and ratings".

Visual Flight Rules (VFR) night flight

According to 14 CFR Part 61, in the United States, the aeronautical experience required for VFR night flight includes a minimum of 3 hours of night flight training that includes—

(i) One cross-country flight of over 100 nautical miles total distance; and

(ii) 10 takeoffs and 10 landings to a full stop (with each landing involving a flight in the traffic pattern) at an airport.

A person who does not meet the night flying requirements may be issued a private pilot certificate with the limitation "Night flying prohibited ", printed on the certificate.

According to the Republic of Poland, Ministry of Transport, Construction and Maritime Economy, in order to receive an authorization for VFR night flight on a Polish pilot license, the minimum requirements are; "the applicant shall have completed at least 5 hours flight time in aeroplanes at night comprising at least 3 hours of dual instruction, including at least 1 hour of cross country navigation and 5 solo take-offs and 5 full stop landings." They also advised the NTSB that in actuality, all flight training organizations in Poland use a longer training period from 8 to 12 hours. Unlike a United States issued pilot certificate, no statement of prohibition of night flying is actually printed on the license, instead if the pilot has met the requirements, the statement; "Is authorized to VFR night flights" will be printed on the license under the "Remarks and Limitations" section.

Review of the pilot rated passenger's Polish private pilot license revealed that it contained an authorization for VFR night flight and that he met the language proficiency requirement in accordance with International Civil Aviation Organization (ICAO) Annex 1(VFR only) for English.

Review of the pilot's Polish private pilot license revealed that it did not contain an authorization for VFR night flight or a statement advising that he met the language proficiency requirement in accordance with

ICAO Annex 1.

Determination of Pilot in Command (PIC)

Examination of the wreckage, photographs of the recovery of the pilot, review of the rental agreement paperwork, and information supplied by US Customs and Border Protection revealed that the pilot was occupying the left front seat during the accident flight, and was acting as the PIC.

Additional Information

FAA Airplane Flying Handbook (FAA-H-8083-3A),

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A), crossing large bodies of water at night in single engine airplanes could be potentially hazardous, not only from the standpoint of landing (ditching) in the water, but also because with little or no lighting the horizon blends with the water, in which case, depth perception and orientation become difficult. During poor visibility conditions over water, the horizon could become obscured, which could result in a loss of orientation. Even on clear nights, the stars may be reflected on the water surface, which could appear as a continuous array of lights, thus making the horizon difficult to identify.

FAA Advisory Circular (AC) 60-4A

FAA's Advisory Circular (AC) 60-4A, entitled "Pilot's Spatial Disorientation," states (in part): "The attitude of an aircraft is generally determined by reference to the natural horizon or other visual

references with the surface. If neither horizon nor surface references exist, the attitude of an aircraft must be determined by artificial means from the flight instruments. Sight, supported by other senses, allows the pilot to maintain orientation. However, during periods of low visibility, the supporting senses sometimes conflict with what is seen. When this happens, a pilot is particularly vulnerable to disorientation. The degree of disorientation may vary considerably with individual pilots. Spatial disorientation to a pilot means simply the inability to tell which way is 'up.' The advisory circular goes on to say that, "The disoriented pilot may place the aircraft in a dangerous attitude..."

FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25)

The FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25) also contained guidance which stated in part that under normal flight conditions, when there is a visual reference to the horizon and ground, the sensory system in the inner ear helps to identify the pitch, roll, and yaw movements of the airplane. When visual contact with the horizon is lost, the vestibular system becomes unreliable. Without visual references outside the airplane, there are many situations where combinations of normal motions and forces can create convincing illusions that are difficult to overcome. In a classic example, a pilot may believe the airplane is in level flight, when, in reality, it is in a gradual turn. If the airspeed increases, the pilot may experience a postural sensation of a level dive and pull back on the stick, which tightens the turn and creates increasing G-loads. If recovery is not initiated, a steep spiral will develop. This is sometimes called the graveyard spiral, because if the pilot fails to recognize that the airplane is in a spiral and fails to return the airplane to wings-level flight, the airplane will eventually strike the ground. If the horizon becomes visible again, the pilot will have an opportunity to return the airplane to straight-and-level flight, and continued visual contact with the horizon will allow the pilot to maintain straight-and-level flight. However, if contact with the horizon is lost again, the inner ear may fool the pilot into thinking the airplane has started a bank in the other direction, causing the graveyard spiral to begin all over again.

The Handbook also advised, that prevention is usually the best remedy for spatial disorientation, and "unless a pilot has many hours of training in instrument flight, flight in reduced visibility or at night when the horizon is not visible should be avoided." A pilot can reduce susceptibility to disorienting illusions through training and awareness, and learning to rely totally on flight instruments.

Administrative Information

Investigator In Charge (IIC):	Gunther, Todd
Additional Participating Persons:	Donald H Casto; FAA / FSDO; Miramar, FL Jerzy Kedzierski; SCAAI; Poland Henry Soderlund; Cessna Aircraft Company; Wichita, KS John Butler; Lycoming Engines; Williamsport, PA
Report Date:	November 4, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=82967