



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	River Ranch, FL	<b>Accident Number:</b>	MIA02LA057
<b>Date &amp; Time:</b>	02/01/2002, 1324 EST	<b>Registration:</b>	N7878N
<b>Aircraft:</b>	Cessna R172E	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	2 Serious

**Flight Conducted Under:** Part 91: General Aviation - Instructional

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## Analysis

The flight departed and proceeded uneventfully to the La Belle Municipal Airport where an uneventful landing was performed. The flight departed to return to the initial departure airport and during cruise flight, the certified flight instructor (CFI) noted a discrepancy with one of the fuel gauges. He landed uneventfully at a nearby airport, and with the engine running, the CFI checked for fuel leaks and checked both fuel tanks; no leakage was noted and both tanks were found to contain a sufficient quantity of fuel. The CFI elected to depart to the return to the original departure airport and approximately 15 minutes into the flight, oil spots were noted on the windshield. The CFI reported the engine lost power shortly after seeing the oil spots. The CFI maneuvered the airplane for a landing in a field maintaining 85 miles-per-hour (mph), and during the landing roll with the flaps retracted, the airplane collided with a berm and became airborne. The airplane then contacted another berm becoming airborne again for a short distance. The airplane then impacted the ground and came to rest upright. The CFI exited the airplane and obtained assistance for the student who remained in the airplane. Examination of the fuel system, fuel vent system, air induction system, exhaust system, and engine assembly revealed no evidence of preimpact failure or malfunction. The crankshaft fracture was noted to be from overstress. On engine testing of the ignition system components revealed no evidence of preimpact failure or malfunction. Bench testing of fuel injection system components and both magnetos revealed no evidence of preimpact failure, a discrepancy was noted with the condensers of both magnetos. Bench testing of the fuel selector valve and flexible fuel lines revealed no evidence of preimpact failure or malfunction. Testing of fuel from the facility that fueled the airplane revealed no discrepancies that would cause a loss of engine power. No determination was made as to the reason for the reported loss of engine power. Review of the "Flight Manual" for the airplane revealed that for forced landings on unprepared surfaces, full flaps should be used if possible with a 75 mph glide.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The reported loss of engine power due to undetermined reasons. Contributing factors in the accident were an improper flap setting, excessive landing speed, and terrain consisting of

berms.

## Findings

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Occurrence #1: LOSS OF ENGINE POWER

Phase of Operation: CRUISE - NORMAL

### Findings

1. (C) REASON FOR OCCURRENCE UNDETERMINED

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Occurrence #2: FORCED LANDING

Phase of Operation: EMERGENCY DESCENT/LANDING

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Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: EMERGENCY LANDING

### Findings

2. (F) IN-FLIGHT PLANNING/DECISION - POOR - PILOT IN COMMAND(CFI)

3. (F) AIRSPEED - EXCESSIVE - PILOT IN COMMAND(CFI)

4. TERRAIN CONDITION - BERM

## Factual Information

On February 1, 2002, about 1324 eastern standard time, a Cessna R172E, N7878N, registered to the U.S. Air Force, operated by Patrick Air Force Base Aero Club, experienced collapse of the nose landing gear while landing in a field near River Ranch, Florida. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 CFR Part 91 instructional flight. The airplane was substantially damaged and the certified flight instructor (CFI) and student pilot were seriously injured. The flight originated about 1107, from Patrick Air Force Base (Patrick AFB), Florida.

The CFI stated that he and his student departed from Patrick AFB and proceeded to the La Belle Municipal Airport where an uneventful landing was performed; he and the student took a break while at the airport. The flight departed from La Belle for Patrick AFB, and while en route, he noticed a discrepancy with the left fuel gauge. The flight proceeded to the Sebring airport where an uneventful landing was performed. While the engine remained running, the CFI exited the airplane and visually checked for fuel leaks and quantity of fuel in both tanks; no leaks were noted and approximately 18 gallons of fuel were noted in each tank. The CFI elected to depart to return to Patrick AFB, and approximately 15 minutes into the flight, the student asked him whether there was oil on the windshield. The CFI replied it was and checked the engine instruments; the oil pressure was in the "green" arc. The CFI further reported that at that time the engine surged, and he took control of the airplane from the student and contacted Patrick AFB air traffic control tower (Patrick AFB ATCT). He confirmed the ignition switch and fuel selector were on both, the mixture was full rich, the fuel pump was on low, and applied full throttle. The engine "power" increased momentarily then decreased to idle rpm. The flight continued and he maneuvered the airplane for an open field maintaining 85 miles-per-hour. After touchdown in the field during the landing roll, he noticed a rise in terrain and applied aft elevator control input. The airplane contacted the rising terrain, became airborne, and impacted the ground with the nose landing gear which sheared off. After the airplane came to rest he exited it and attempted to get the student out but was unable. Unable to establish two way radio communications to summon help, he activated the emergency locator transmitter and walked to a road where he stopped a passing motorist who in turn called 911.

The student pilot stated that while proceeding direct to Patrick AFB, during straight and level flight "spots" appeared on the windshield. The CFI initially thought the spots were bird droppings but both concluded it was oil. Shortly after observing the spots on the windshield, the engine lost "rpm" and the CFI took the controls of the airplane. He believed the propeller stopped rotating before the CFI landed the airplane in a field that looked "...fairly smooth." He further reported he, "... did not see any fence or ditch until just before we crossed the ditch during rollout." The CFI left to get help while he remained in the airplane for 2-3 hours before being evacuated via helicopter.

According to a transcription of communications with Patrick AFB ATCT, two-way communications were established with that facility and at 1321:29, an occupant advised, "we are 30 miles out with an engine failure." The controller acknowledged the transmission and asked the position of the airplane. An occupant responded, "we are 30 about 30 miles south of Melbourne", followed immediately with, "we are losing our engine power and altitude." The controller responded by first advising the flightcrew to contact Daytona Approach, which was acknowledged, but the controller then advised the flightcrew to contact Miami. The last transmission from the controller was not acknowledged by the flight crew.

The accident site was examined by the FAA inspector-in-charge (FAA IIC), along with representatives of the United States Air Force, and Patrick AFB Aero Club. A representative of Cessna Aircraft Company examined the site after the airplane was recovered. According to the FAA IIC, after touchdown in the field, the airplane rolled approximately 400 feet where it collided with a berm. The airplane became airborne traveling approximately 65 feet where it impacted another berm causing the nose landing gear to separate. The airplane became airborne again traveling 5 feet where it impacted the ground nose first creating a 6-inch deep trench. The airplane came to rest in an upright position with the empennage elevated approximately 108 feet from the point of contact with the first berm; the airplane was recovered for further examination.

Examination of the airplane and engine following recovery was performed by the parties to the investigation with FAA oversight. The left and right fuel tanks were found to contain approximately 8 gallons and 9 gallons of 100 low lead fuel, respectively. The fuel reservoir tank was found to be empty; a fractured fuel line was noted between the reservoir tank and the fuel strainer. The gascolator was found to be full of fuel, no water was present. No obstructions of the fuel vent system, air induction system, or exhaust system were noted. With the exception of the fractured fuel line between the reservoir tank and fuel strainer, fuel system continuity was confirmed. The auxiliary fuel pump operationally checked good. The fuel selector was found in the detent of the both position. A light coating of oil was noted on the fuselage belly skins. Examination of the engine revealed the propeller appeared initially to be attached to the engine but separated when the FAA IIC attempted to verify if the propeller was secured. The crankshaft was fractured aft of the propeller mounting flange, continuity was established from the fracture surface to the accessory section. Camshaft, and valve train continuity was confirmed by rotation of an adapter installed at the vacuum pump pad location, suction and compression were noted in all cylinders with rotation of the adapter. No discrepancies were noted with the magnetos, ignition harness, or ignition switch when tested. A total of 8 quarts of oil were drained from the engine; the oil was clean and gold in color (oil capacity is 10 quarts). The crankshaft, manifold valve, fuel injector nozzles and lines, mechanical fuel pump, both magnetos, throttle and metering unit, fuel selector valve, and flexible fuel lines were retained for further examination.

Metallurgical examination of the fractured crankshaft was performed by the NTSB Materials Laboratory, located in Washington, DC. The results of the examination indicate the fracture surface exhibited evidence of overstress separation; no fatigue was noted.

Examination and bench testing of the mechanical fuel pump, manifold valve, throttle and metering unit, and fuel injector nozzles and lines was performed with NTSB oversight. Bench testing of the mechanical fuel pump revealed leakage from the damaged mixture shaft. The discharge pressure was higher than specified at 600 and 2,200 rpm. The discharge pressure in terms of pounds-per-hour (pph) was less than specified when tested twice at different fuel flow rates at 2,200 rpm. Bench testing of the manifold valve with the fuel injector nozzles and lines revealed the unit flowed greater than specified when tested at 50 and 100 pph, respectively. The metering unit which was received partially disassembled was reassembled for bench testing which revealed the unit flowed greater than specified at all test points. The NTSB investigator who witnessed the tests reported the metering unit could be adjusted to flow within limits.

Examination and bench testing of the magnetos was also performed with NTSB oversight.

Bench testing revealed both magnetos produced spark at all terminals when operated from 150 to 4,701 magneto rpm. The internal timing of both magnetos was satisfactory and the contact gap of both magnetos were within limits. The contact surfaces of the left magneto were noted to have slight pitting; no pitting was noted on the contact surfaces of the right magneto. The left and right condenser checked .29 and .3 microfarads respectively, specification is .35 + or - 10 percent.

Testing of the fuel selector valve and flexible fuel lines was performed at Cessna Aircraft Company with FAA oversight. Flow testing of the flexible fuel lines from the accident airplane was performed in both directions and was compared with flow testing results of similar new lines. Flow testing of the accident fuel selector valve was performed and was compared with the flow test results of a new fuel selector valve. No appreciable difference was noted when flow testing the accident lines and fuel selector valve when compared with new lines and valve. Sediment was noted to flow from the accident flexible hose from the fuel pump to metering unit during bench testing. Disassembly of the accident fuel selector valve revealed the cam measured within .002 inch when compared with a new cam. A gasket was missing between the main body of the valve and the valve cover; red-orange colored sealant was observed on the faying surfaces of the main body and valve cover.

Review of the airframe maintenance records revealed the airplane was inspected last on January 26, 2002, in accordance with a 100-hour inspection. The same entry indicates a new o-ring was installed in the fuel selector valve. The airplane had accumulated approximately 6 hours since the inspection at the time of the accident. Review of the provided "Archived Closed Write-ups Report" sheets that begin with an entry dated March 10, 2001, through June 23, 2001, revealed no recorded engine related discrepancies. Review of the "Deferred and Closed Write-ups Report" sheets that begin with an entry dated June 26, 2001, through January 29, 2002, revealed 2 entries related to engine discrepancies. The first entry dated July 7, 2001, indicates discrepancies related to both magnetos; the corrective action was retiming of the magnetos to factory specifications. The second entry dated September 5, 2001 indicates a rpm drop of 350 when checking the left magneto; the corrective action was, "8 Sep, [magneto] check ok."

Testing of a sample of fuel taken from the facility that fueled the airplane was performed by the United States Air Force. The results of the analysis revealed no evidence of cross contamination; 43 parts per million weight (ppmw) of water were detected in the submitted sample. According to the president of a fuels laboratory, the finding of 43 ppmw is not significant.

Review of the airplane's "Flight Handbook" revealed no reference to emergency procedures to follow in preparation for a forced landing. The handbook does have a maximum glide distance chart. Review of the "Flight Manual" for the United States Air Force (USAF) series T-41C/D airplane revealed that for forced landings on unprepared surfaces, "...if possible, use full flaps and a 75 mph glide. Land on the main gear, holding the nosewheel off the ground as long as possible." A note indicates that full flap glides are very steep and require an aggressive flare just before touchdown in order to prevent landing on the nose landing gear first.

The airplane minus initial retained components was released to William C. Donnell, Manager, Patrick AFB Aero Club, on February 20, 2002. The initial retained components were also released to William C. Donnell, on April 6, 2002. Additional retained components consisting of the fuel selector valve and flexible fuel lines were released to Donald Opel, Chief Pilot,

Patrick AFB Aero Club, on January 3, 2003.

### Flight Instructor Information

<b>Certificate:</b>	Flight Instructor; Commercial	<b>Age:</b>	26, Male
<b>Airplane Rating(s):</b>	Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	12/13/2000
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	11/26/2001
<b>Flight Time:</b>	1000 hours (Total, all aircraft), 350 hours (Total, this make and model), 800 hours (Pilot In Command, all aircraft), 350 hours (Last 90 days, all aircraft), 150 hours (Last 30 days, all aircraft)		

### Student Pilot Information

<b>Certificate:</b>		<b>Age:</b>	
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>		<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>		<b>Last FAA Medical Exam:</b>	
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>			

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N7878N
<b>Model/Series:</b>	R172E	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal; Utility	<b>Serial Number:</b>	R172-0269
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	01/26/2002, 100 Hour	<b>Certified Max Gross Wt.:</b>	2500 lbs
<b>Time Since Last Inspection:</b>	5.97 Hours	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	14282 Hours at time of accident	<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	Installed, activated, did not aid in locating accident	<b>Engine Model/Series:</b>	IO-360-DB
<b>Registered Owner:</b>	U.S. Air Force	<b>Rated Power:</b>	210 hp
<b>Operator:</b>	Patrick AFB Aero Club	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	MLB, 33 ft msl	<b>Distance from Accident Site:</b>	32 Nautical Miles
<b>Observation Time:</b>	1253 EST	<b>Direction from Accident Site:</b>	44°
<b>Lowest Cloud Condition:</b>	Few / 6000 ft agl	<b>Visibility</b>	10 Miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	90°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.14 inches Hg	<b>Temperature/Dew Point:</b>	26° C / 21° C
<b>Precipitation and Obscuration:</b>			
<b>Departure Point:</b>	Patrick AFB, FL (COF)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>		<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	1107 EST	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 Serious	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Serious	<b>Latitude, Longitude:</b>	27.740000, -81.100000

## Administrative Information

**Investigator In Charge (IIC):** Timothy W Monville **Report Date:** 03/30/2004

**Additional Participating Persons:** William Edwards; FAA FSDO; Orlando, FL  
Scott Rodesky; USAF; Patrick AFB, FL  
Robert S August; Cessna Aircraft Company; Wichita, KS  
Albert P Butler; Teledyne Continental Motors; Mobile, AL  
Donald M Opel; Patrick AFB Aero Club; Patrick AFB, FL  
Terrence M Carraway; Patrick AFB Aero Club; Patrick AFB, FL  
Samuel L Rogers; USAF; Patrick AFB, FL

**Publish Date:**

**Investigation Docket:** NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at [pubinq@ntsb.gov](mailto:pubinq@ntsb.gov), or at 800-877-6799. Dockets released after this date are available at <http://dms.nts.gov/pubdms/>.

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).