# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | Plymouth, Massachusetts | **Accident Number:** | ERA10LA317 |
| **Date & Time:** | June 18, 2010, 17:03 Local | **Registration:** | N401TE |
| **Aircraft:** | Cessna 401 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Fuel starvation | **Injuries:** | 3 Serious |
| **Flight Conducted Under:** | Part 91: General aviation - Other work use | | |

## Analysis

The airplane was returning from a 3-hour aerial mapping mission and was lined up for a straight-in, 5-mile final approach for landing. About 3 miles out on final approach, and prior to performing the before-landing check, both engines stopped producing power in sequence, one almost immediately after the other. The pilot said that by the time he completed his remedial actions the airplane had descended to about 200 feet above the ground and the engines would not restart. The auxiliary fuel tank gauges were bouncing between 2-5 gallons and the main tanks were bouncing around at 25 gallons per side. The pilot then selected a forced landing site between two large trees and landed the airplane in heavily wooded terrain. A detailed examination of the wreckage revealed no evidence of preimpact mechanical anomalies. According to information contained in the aircraft manufacturer's owner's manual, the auxiliary fuel tanks are designed for cruising flight and are not equipped with pumps; operation near the ground (below 1000 feet) using auxiliary fuel tanks is not recommended. The first step in the before-landing check was to select the main fuel tanks on both the left and right fuel selectors, respectively. The pilot indicated that he should have selected the main tanks sooner and performed the before-landing check earlier in the approach.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A total loss of engine power during final approach due to fuel starvation as a result of the pilot's delayed configuration of the airplane for landing.

## Findings

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| **Personnel issues** | Delayed action - Pilot |
| **Aircraft** | Fuel - Fluid management |

## Factual Information

HISTORY OF FLIGHT

On June 18, 2010 at 1703 eastern daylight time, a Cessna 401, N401TE, operated by Global Data Aviation, was substantially damaged when it collided with trees and terrain after a total loss of engine power while maneuvering for landing at the Plymouth Municipal Airport (PYM), Plymouth, Massachusetts. The certificated airline transport pilot and two passengers were seriously injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight which departed PYM, about 1355. The aerial mapping flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

In written statements, two witnesses who were in close proximity to the airport described the airplane at "low altitude" and "awfully low" when compared to other airplanes they had watched make the same approach. One witness heard the airplane approach and then the engine noise stopped as the airplane passed overhead. The airplane disappeared from his view, and when he heard the sounds of impact with the trees, he responded to the site to check the condition of the occupants. Upon his arrival, he recalled that there were no smoke or gas fumes present. The occupants were alert but trapped in their seats. Later, at the hospital, the pilot told the witness that he lost engine power, and was unable to restart the engine in time to avoid crashing due to the low altitude.

In a telephone interview, the operator said that he spoke to the pilot who reported that both engines lost power, and that he could not get them restarted.

On June 25, 2010, the pilot was interviewed by telephone and later provided a written statement to the NTSB investigator-in-charge. The pilot reported that the aerial mapping flight was suspended because the sun angle was no longer optimum for the performance of the on-board camera, and they began the return flight to PYM. Approximately 8 miles from their destination, the pilot cancelled flight following services, radioed that he was inbound to PYM, and lined up on a 5-mile, straight-in visual approach to runway 24.

The pilot further reported that approximately three miles out on final approach, just prior to his final landing check, one engine lost power and almost immediately the second engine lost power. He immediately switched from the auxiliary tanks to the main fuel tanks, checked that the mixture controls were full forward, checked that the electric fuel pump was on low, checked the magnetos, and looked at the fuel gauges. The auxiliary tank gauges were bouncing between 2-5 gallons and the main tanks were bouncing around at 25 gallons per side. At this point, the airplane was already at a low altitude and the engines were not catching. The engines were windmilling so the pilot tried the starters to attempt to re-start the engines.

The pilot said that by the time he completed his remedial actions to restore engine power, the airplane had descended to about 200 feet above the ground and the engines would not restart. He then selected a forced landing site between two large trees and landed the airplane in heavily wooded terrain.

PERSONNEL INFORMATION

According to Federal Aviation Administration (FAA) records, the pilot held an airline transport pilot certificate with ratings for airplane multiengine land, and a commercial pilot certificate with a rating for airplane single engine land. His most recent FAA first class medical certificate was issued in October 2009. The pilot reported 3,500 total hours of flight experience, of which, 1,200 hours were in the accident airplane make and model.

AIRCRAFT INFORMATION

The airplane was manufactured in 1968, And according to the operator, the airplane had accrued 13,252 total aircraft hours. It's most recent annual inspection was completed on June 1, 2010 at 13,231 hours.

According to the pilot and fuel purchase records, the airplane departed on the accident flight with full fuel tanks.

METEOROLOGICAL INFORMATION

At 1652, the weather conditions reported at PYM were, clear skies, visibility 10 miles, with wind from 210 at 12 knots gusting to 22 knots. The temperature was 25 degrees Celsius (C), dewpoint 14 degrees C, and the barometric pressure was of 30.04 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane was examined at the accident site by FAA aviation safety inspectors. The airplane wreckage came to rest in wooded terrain, and all major components were accounted for at the scene. The wreckage path was oriented about 180 degrees. Both wings were separated from the aircraft outboard of the engine nacelles, through the auxiliary fuel tank areas, and the structure of both wings exhibited multiple impact marks from striking trees. The fuselage structure was relatively intact. The cockpit seats and seat number 3 were attached to the floor rails and seat number 4 was removed from the aircraft by first responders. No shoulder harnesses were installed and the lap-belts were found intact and unlatched.

Flight control cable continuity was established throughout the airframe from the cockpit controls to the flight control surfaces. The flap actuator measurement equated to a retracted setting. The entire horizontal stabilizer, elevators, and elevator trim tab were found separated from the airplane, and remained attached by the elevator trim tab cables only. The estimated elevator trim tab measurement equated to a setting greater than 6 degrees tab up.

The fuel selector handles were in the OFF position and both valves were separated from the wings and exhibited damage consistent with impact. Both propellers were separated from their respective engines, and showed little to no signatures of rotation at impact. According to the pilot, he placed the fuel selectors in the off position at the request of first responders.

ADDITIONAL INFORMATION

Cessna 401 Owner's Manual Excerpts (Checklist and Fuel System Information)

Before Landing

1. Fuel Selectors - Left Engine - Left Main (Feel for detent) Right Engine - Right Main (Feel for detent)
2. Alternate Air Controls - Check IN
3. Mixtures - FULL RICH or lean as require for smooth operation
4. Propellers - High RPM
5. Wing Flaps - 15° below 180 MPH
6. Landing Gear - Extend below 160 MPH
7. Landing Gear Position Indicator Lights - Check green lights ON
8. Wing Flaps - 15° - 45° below 160 MPH
9. Cowl Flaps - CLOSED or as required
10. Auxiliary Fuel Pumps - ON
11. Minimum Multi-Engine Approach Speed - 110 MPH
12. Minimum Single-Engine Control Speed - 95 MPH

Optional Auxiliary Fuel System

Auxiliary tanks (20 gal. usable each wing) were installed in each wing just outboard of each engine nacelle. They feed directly to the fuel selector valves. Fuel vapor and excess fuel from the engines are returned to the main fuel tanks. The auxiliary tank is vented into the main tank. The main tank is in turn vented to the atmosphere.

When the selector valve handles are in the AUXILIARY position, the left auxiliary tank feeds the left engine and the right auxiliary tank feeds the right engine. If the auxiliary tanks are to be used, select fuel from the main tanks for 60 minutes prior to switching to auxiliary tanks. This is necessary to provide space in the main tanks for vapor and fuel returned from the engine-driven fuel pumps when operating on auxiliary tanks. If sufficient space is not available in the main tanks for this diverted fuel, the tanks may overflow through the vent line. Since part of the fuel from the auxiliary tanks is diverted back to the main tanks instead of being consumed by the engines these tanks will run dry sooner than may be anticipated. However, the main tank endurance will be increased by the returned fuel. Since the auxiliary fuel tanks are designed for cruising flight, they are not equipped with pumps and operation near the ground (below 1000 feet) using auxiliary fuel tanks is not recommended.

NTSB Form 6120.1 Pilot/Operator Report

In the Recommendation (How could this accident/incident been prevented?) section of the NTSB Form 6120.1, the pilot responded, “Select the main [fuel] tanks much sooner prior to approach…Perform GUMPS [before-landing check] earlier in approach sequence.”

## History of Flight

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| **Approach-VFR pattern final** | Fuel starvation (Defining event) |
| **Approach-VFR pattern final** | Loss of engine power (total) |
| **Emergency descent** | Off-field or emergency landing |
| **Emergency descent** | Collision with terr/obj (non-CFIT) |

## Pilot Information

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| **Certificate:** | Airline transport; Commercial | **Age:** | 30,Male |
| **Airplane Rating(s):** | Single-engine land; Multi-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 1 Without waivers/limitations | **Last FAA Medical Exam:** | October 31, 2009 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | April 28, 2010 |
| **Flight Time:** | 3500 hours (Total, all aircraft), 1200 hours (Total, this make and model), 2100 hours (Pilot In Command, all aircraft), 175 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Cessna | **Registration:** | N401TE |
| **Model/Series:** | 401 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 401-0180 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 8 |
| **Date/Type of Last Inspection:** | May 10, 2010 Annual | **Certified Max Gross Wt.:** | 6300 lbs |
| **Time Since Last Inspection:** | 64 Hrs | **Engines:** | 2 Reciprocating |
| **Airframe Total Time:** | 2004 Hrs at time of accident | **Engine Manufacturer:** | CONT MOTOR |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | TSIO-520-E |
| **Registered Owner:** | | **Rated Power:** | 300 Horsepower |
| **Operator:** | | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | PYM,148 ft msl | **Distance from Accident Site:** | 2 Nautical Miles |
| **Observation Time:** | 16:52 Local | **Direction from Accident Site:** | 240° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 12 knots / 22 knots | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 210° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.04 inches Hg | **Temperature/Dew Point:** | 25°C / 14°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Plymouth, MA (PYM ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Plymouth, MA (PYM ) | **Type of Clearance:** | Traffic advisory |
| **Departure Time:** | 14:55 Local | **Type of Airspace:** | |

## Airport Information

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| **Airport:** | Plymouth Municipal Airport PYM | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 148 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 24 | **IFR Approach:** | None |
| **Runway Length/Width:** | 4349 ft / 75 ft | **VFR Approach/Landing:** | Forced landing;Traffic pattern |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Serious | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | 2 Serious | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 3 Serious | **Latitude, Longitude:** | 41.926109,-70.700553 |

## Administrative Information

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| **Investigator In Charge (IIC):** | Rayner, Brian |
| **Additional Participating Persons:** | Seth Buttner; Cessna Aircraft Company; Wichita, KS<br>Gary Hulverson; FAA/FSDO; Lexington, MA<br>Richard Bunker; Massachusettes Department of Aeronautics; Boston, MA |
| **Original Publish Date:** | June 27, 2011 |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=76372 |