# Aviation Investigation Final Report

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| **Location:** | Millington, Tennessee | **Accident Number:** | ERA09FA083 |
| **Date & Time:** | December 9, 2008, 10:58 Local | **Registration:** | N452MA |
| **Aircraft:** | Mitsubishi MU-2B-60 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Loss of engine power (partial) | **Injuries:** | 1 Minor |
| **Flight Conducted Under:** | Part 91: General aviation - Positioning | | |

## Analysis

According to the pilot, after he took off for a nearby airport he raised the landing gear but did not raise the 20-degree flaps per the “after takeoff” checklist. Shortly thereafter, when the airplane was at an altitude of about 2,400 feet, and in "heavy rain," the pilot noticed that the right engine was losing power. He subsequently feathered the propeller as engine power reduced to 40 percent, but still did not raise the flaps. Weather, recorded shortly before the accident, included scattered clouds at 500 feet, and a broken cloud layer at 1,200 feet, and the pilot advised air traffic control (ATC) that he would fly an ILS (instrument landing system) approach if he could maintain altitude. After maneuvering, and advising ATC that he could not maintain altitude, the pilot descended the airplane to a right base leg where, about 1/4 nautical mile from the runway, it was approximately 300 feet above the terrain. The pilot completed the landing, with the airplane touching down about 6,200 feet down the 8,000-foot runway, heading about 20 degrees to the left. The airplane veered off the left side of the runway and subsequently went through an airport fence. The left engine was running at “high speed” when fire fighters responded to the scene. The right engine propeller was observed in the feathered position at the scene, and after subsequent examinations, the right engine was successfully run in a test cell with no noticeable loss of power. There was no determination as to why the right engine lost power in flight, although rain ingestion is a possibility. Airplane performance calculations indicated that with the landing gear up, a proper single-engine power setting and airspeed, and flaps raised, the airplane should have been able to climb about 650 feet per minute. Even with flaps at 20 degrees, it should have been able to climb at 350 feet per minute. In either case, unless the airplane was not properly configured, there was no reason why it should not have been able to maintain the altitudes needed to position it for a stabilized approach.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper configuration of the airplane following an engine shutdown, which resulted in a low-altitude, unstabilized approach. Contributing to the accident was a loss of engine power for undetermined reasons.

### Findings

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| **Aircraft** | Configuration - Not attained/maintained |
| **Aircraft** | (general) - Inoperative |

# Factual Information

## History of Flight

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| **Enroute** | Loss of engine power (partial) (Defining event) |
| **Enroute** | Engine shutdown |
| **Landing** | Abnormal runway contact |

HISTORY OF FLIGHT

On December 9, 2008, at 1058 central standard time, a Mitsubishi MU-2B-60, N452MA, was substantially damaged while returning to land, following a reported loss of engine power, at Millington Regional Jetport (NQA), Millington, Tennessee. The certificated airline transport pilot incurred minor injuries, and visual meteorological conditions prevailed. The airplane was operating on an instrument flight rules flight plan from NQA to Charles W. Baker Airport (2M8), Millington, Tennessee. The positioning flight was conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 91.

According to the pilot, the airplane was based at 2M8. He had flown to NQA to buy fuel, and was on his way back to 2M8 to meet a passenger.

The pilot also noted that he had twice been held on the ground by air traffic control for 15 minutes to let storm cells pass by. After being cleared to depart, the pilot took off from runway 4, utilizing 20-degree flaps. After takeoff, he raised the landing gear, maintained the 20-degree flaps, and headed northwest. About 2 1/2 miles from the airport, the pilot noticed a loss of power from the right engine. He believed that it could have gone to “continuous ignition,” but was not sure, and that the loss of power could have been a result of rain. As the torque dropped to about 40 percent, the pilot decided to feather the propeller while he was still able to do so. After it was feathered "with no problem," the pilot secured the engine.

The pilot subsequently added full power to the left engine while maintaining the 20-degree flaps. The controller asked if he would like to continue to 2M8, and the pilot responded no, he'd like to go back to NQA. The controller also noted the possibility of landing on route 51, which the pilot declined. About that time, winds and wind shear increased, and the airplane encountered heavy rain.

The pilot also reported that he was only able to maintain altitudes between 1,000 feet and 1,400 feet due to turbulence. When asked if he felt the airplane could climb, the pilot stated that he didn't know, that he tried to climb a couple of times but didn't know if wind shear was preventing it. He also stated that he felt the airplane "conformed to standards."

Approaching mid-field NQA, the pilot attempted to land on runway 22, but had difficulty

because he was "in too tight" and wanted to make half turns with only one engine. He made the approach about 105 knots; it was normally about 100 knots; and landed about 2/3 of the way down the runway.  During the landing, the nose landing gear and the left wing collapsed, and the airplane veered off the left side of the runway.

A review of air traffic control transcripts revealed that,

At 1037, the airplane was released for departure.

At 1041, the airplane was radar-identified, and the controller told the pilot to climb to 2,300 feet. The pilot initially requested a visual approach to 2M8, but subsequently opted for a GPS (global positioning system) approach to runway 18. The controller then provided 020-degree vector.

At 1044, after two more vectors, the pilot stated, “we’re starting to have a problem with the right engine.” The controller asked the pilot if he’d like to continue to 2M8, and the pilot responded that he would. The controller then gave the pilot a final vector, and cleared him to join the localizer.

At 1045, the pilot stated, "we’re losing power on the right engine," and subsequently declared an emergency. The controller asked the pilot if he’d like to continue to the approach, and the pilot initially said he would. After additional transmissions, at 1047, the pilot stated, “…trying to maintain altitude down to two thousand.”

The pilot and controller subsequently discussed approach options, and the pilot decided to attempt the ILS (instrument landing system) runway 22 approach “into uh Millington, we’re going to need a long approach if I can hold this altitude.”

The controller then provided vectors for the approach, along with the current weather.

At 1050, the controller advised the pilot that the airport was “one o’clock four miles.” The pilot replied, “looking no joy,” then, “and we’re losing altitude.”

At 1051, the controller stated, "low altitude alert," and the pilot responded, "we’re trying." The controller then told the pilot that the airport was “one to one thirty and three miles,” and the pilot responded, “i-m-c.”

The controller continued to provide vectors for the ILS runway 22 approach, and the pilot asked the controller to call the pilot’s office and advise them, “lost an engine and don’t know why.” He then added, “heard a popping noise and then some kind of uh sound like a lock up.”

After the controller provided another vector and the pilot provided contact information, the pilot stated, “still losing altitude.” When the controller reported the airplane “about seven and a half miles out,” the pilot stated, at 1055, “still losing altitude, down to eight hundred.” He later

stated, “terrain warning,” followed by, “down to a hundred and twenty knots.”

The controller subsequently pointed out highway 51, and that the airport was 5 miles southwest of the airplane’s position.

At 1057:12, the controller advised the pilot that the airport was “twelve o’clock two and a half miles,” and the pilot responded, “giving it all I can give it.” The controller then responded, “about ten degrees left should set you almost straight into runway two two,” and the pilot responded, “barely above the trees.”

After additional transmissions, at 1057:51, the controller advised the pilot that highway 51 was “just off your right, airport at eleven thirty and about two miles,” and the pilot responded, “too many people on fifty one.”

At 1058:09, the controller advised the pilot to turn 10 degrees to the left, and about 15 seconds later, asked “do you have Millington in sight?” The pilot responded, “I got Millington in sight but, I’m off the, it’s not, uh.” The controller then advised, at 1058:34, “November two mike al alpha, you’re cleared to land any runway at Millington.”

The pilot was not in radio contact with the tower. However, just prior to the landing, the tower controller advised airport crash/rescue, “emergency aircraft just turning mid-field to land.”

According to Millington Fire Department reports, units were staged in anticipation of the landing on runway 22. When the airplane appeared, it was “in line with the runway but looked extremely unstable. The plane seemed to be about 15 to 30 feet above the ground and stayed that way all the way down the runway until he reached about the bravo area and he crashed onto the runway and immediately turned left.” The airplane continued left, crossed a taxiway, and impacted the airport property fence before coming to a stop. Firefighters then followed the path of the airplane, and upon arriving on scene, found that the pilot was still inside the airplane, the right engine was shut down, and the left engine was still running "at high speed." Firefighters subsequently sprayed foam into the left engine to stall it, and after it shut down, they removed the pilot from the airplane.

## PERSONNEL INFORMATION

The pilot, age 42, held an airline transport pilot certificate with airplane single-engine land, and multiengine land ratings. The pilot reported 5,311 hours of total flight time with 4,246 hours of multiengine time and 662 hours in make and model. His latest FAA second class medical certificate was obtained on March 1, 2007, and his latest flight review was completed on July 17, 2008, in the accident airplane.

## AIRCRAFT INFORMATION

The airplane was powered by two (Honeywell) Garrett Turbine Engine Company TPE 331-10-

511M turboprop engines flat rated to 715 shaft horsepower. Each engine drove a Hartzell four-blade, constant speed, full feathering, reversible pitch, 98-inch diameter propeller.

According to maintenance records, the latest 100-hour, 200-hour, and 1-year engine inspections occurred on June 24, 2008.

## AIRPORT INFORMATION

Runway 22 was 8,000 feet long and 200 feet wide. Airport elevation was 320 feet above mean sea level.

## RADAR INFORMATION

Radar information indicated that the airplane reached a maximum of 2,400 feet msl at 1042:49, and maintained between 2,300 feet and 2,400 feet until 1045:54. The airplane then began a descent, until the last radar contact, at 600 feet msl, at 1058:40. The last radar contact was about 1/4 nautical mile, 330 degrees from the threshold of runway 22, about 300 feet above the ground.

## WRECKAGE AND IMPACT INFORMATION

According to the Federal Aviation Administration (FAA) inspector in charge of the on-scene investigation, tire marks consistent with the position of the left main landing gear were first located about 6,200 feet from the beginning of the runway, about 3 feet from the runway's left edge. The marks headed about 200 degrees, off the left side of the runway and into the grass. Additional tire marks, consistent with the position of the nose landing gear were found about 50 feet beyond the first marks, and tire marks consistent with the position of the right main landing gear were found about 200 feet beyond those. Subsequent ground tracks revealed a "shallow arc to the left for a distance of over 250 yards." The tracks then went through a chain link fence, and continued beyond the fence for another 150 yards.

The majority of the left wing was found broken off about halfway along the ground track, and where the airplane came to rest, the left fuselage was found severed in the vicinity of the left propeller.

The flaps were found extended to 20 degrees and the landing gear were down.

The right engine was found in the feathered position, and appeared to be undamaged except for a dent in the spinner dome. The propeller appeared to rotate "normally," and there was no damage evident in the first stage compressor or third stage turbine wheel.

## METEROLOGICAL INFORMATION

Weather, recorded at the airport at 1050, included calm winds, visibility 3 statute miles, light

rain, mist, scattered clouds at 500 feet, a broken cloud layer at 1,200 feet, an overcast cloud layer at 2,300 feet, temperature 12 degrees Celsius, dew point 12 degrees Celsius, and an altimeter setting of 29.82 inches of mercury (Hg).

A special weather observation, at 1101, included winds from 080 degrees true at 3 knots, visibility 4 statute miles, light rain, mist, a few clouds at 400 feet, scattered clouds at 2,300 feet, a broken cloud layer at 3,100 feet, temperature 12 degrees Celsius, dew point 12 degrees Celsius, and an altimeter setting of 29.82 inches Hg.

According to an on-scene firefighter report, “heavy rain/thunderstorms were present the entire time of the incident.”

Transmissions between two air traffic control facilities, at 1037, indicated “heavy and extreme weather is east of Charles Baker now…moving east northeast.” There was also “a little bit of heavy precipitation just north of Charles Baker.”

TESTS AND RESEARCH

After the airplane was moved to a storage facility, both engines were removed and forwarded to Honeywell for further examination and if feasible, testing, under FAA Los Angeles Aircraft Certification Office (ACO) oversight. An Examination and Test Cell Report was subsequently produced by the manufacturer, which included:

“No preexisting condition was identified on either the left or right engine that would have interfered with normal operation prior to the accident sequence.” In addition:

The left engine torsion shaft was separated, which precluded engine test cell runs. A disassembly of the engine revealed rotational scoring on the first-stage and second-stage compressor shrouds, and all three turbine stator shrouds, and metal spray was found at various positions along the gas path.

The right engine did not exhibit any preaccident damage, and no unusual noises were noted while turning the rotating elements of the engine. There was no visible debris on either the oil filter element or the fuel filter element. Initial engine test cell startup attempts required test cell instrumentation debugging. However, once the engine was started, it indicated a maximum of 1,018 shaft horsepower (shp), which was 18 shp more than that required for an overhauled or repaired engine, and 2 shp less than that required for a new production engine.

Right engine torque transducer calibration checks revealed that, at 100 percent torque, the voltage output was 0.120 volts lower than the lower limit, which translated to a 3.0 percent indicated torque error.

Additional engine examination and test results may be found in the NTSB Public Docket associated with this accident.

ADDITIONAL INFORMATION

Excerpts from the Airplane Flight Manual (AFM) include:

Under “Normal Procedures”:

- AFTER TAKEOFF-

When positive rate of climb is established:
1. Maintain pitch attitude 13 degrees Nose UP maximum.
When positive rate of climb is established:
2. Landing Gear…Up
3. Airspeed……120 CAS (5 degrees Flap Takeoff)113 CAS (20 degrees Flap Takeoff)
4. Flaps – After gear retraction complete
    a. 20 degrees Flap Takeoff……to 5 degrees
    b. 5 degrees Flap Takeoff……to UP
5. Airspeed……140 KCAS MINIMUM
6. Flaps (20 degrees Flap Takeoff)……UP
7. Airspeed (Normal Climb)……155 KCAS

-VISIBLE MOISTURE ENCOUNTERS –

Entering Visible Moisture from Dry Conditions (Cruise at 650 degrees C EGT)

Engine EGT will decrease when entering visible moisture. Unless a critical thrust condition exists:

1. Power Levers……DO NOT MOVE. MONITOR EGT. IF EGT DECREASES BELOW 630 DEGREES C, ADJUST POWER LEVERS TO MAINTAIN 630 DEGREES C UNTIL CLEAR OF VISIBLE MOISTURE.

Under “Emergency Procedures”:

- ENGINE FAILURE AFTER LIFTOFF – GEAR DOWN OR IN TRANSIT -

Warning. If flaps twenty degrees takeoff is selected and engine failure occurs after liftoff, continued climb performance is not assured unless the landing gear has completely retracted, the gear doors are closed, and the flaps are at 5 degrees or less.”

- ENGINE FAILURE IN TAKEOFF CLIMB – GEAR FULLY RETRACTED -

2. Flaps…5 degrees.
5. Flaps…Up.

- ENGINE SHUTDOWN PROCEDURE -

If engine failure occurs, or if a sudden loss or significant fluctuation (plus or minus 7.75 percent) of indicated torque pressure occurs, as indicated by airplane yaw, promptly shutdown the affected engine and determine the cause prior to further operation.

The AFM did not have a procedure for an engine failure in flight, except for a DRIFTDOWN PROCEDURE with a failed engine above 25,000 feet. Neither the DRIFTDOWN PROCEDURE nor the ENGINE SHUTDOWN PROCEDURE addressed drag influences such as landing gear or flaps.

- SINGLE ENGINE LANDING -

Warning – Do not attempt a go-around below 400 feet or after 20 degrees of flaps are selected.

Under “Performance”:

- Single Engine Best Rate of Climb -

The chart criteria assumes:

Operating Engine: Maximum Continuous Power
Inoperative Engine: Propeller Feathered
Climb Speed: Best Rate of Climb Speed
Landing Gear: Retracted
Flaps: Up
Bleed Air: Off
Wings: Level

Based on the above criteria, the ambient conditions, and the weight of the airplane at the time of the accident, as provided by the pilot, the airplane should have been able to climb about 650 feet per minute on one engine at 145 knots calibrated airspeed.

- Single Engine Best Rate of Climb –

The chart criteria assumes:

Operating Engine: Takeoff power
Inoperative Engine: Propeller Feathered
Climb Speed: 135 KCAS (Vyse)
Landing Gear: Retracted
Flaps: 20 degrees

Bleed Air: Off

Based on the above criteria, the ambient conditions, and the weight of the airplane at the time of the accident, as provided by the pilot, the airplane should have been able to climb about 350 feet per minute on one engine at 135 knots calibrated airspeed, with the flaps extended to 20 degrees.

In response to follow-up questions via email, the pilot stated that the single engine power settings used were between 90 and 100 percent, that the airspeed was 140 knots, and that there were no controllability issues with the airplane.

## Pilot Information

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| **Certificate:** | Airline transport | **Age:** | 42,Male |
| **Airplane Rating(s):** | Single-engine land; Multi-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 2 | **Last FAA Medical Exam:** | March 1, 2007 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | July 17, 2008 |
| **Flight Time:** | 5311 hours (Total, all aircraft), 662 hours (Total, this make and model), 63 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Mitsubishi | **Registration:** | N452MA |
| **Model/Series:** | MU-2B-60 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 1533 S.A. |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 8 |
| **Date/Type of Last Inspection:** | June 24, 2008 Annual | **Certified Max Gross Wt.:** | 11575 lbs |
| **Time Since Last Inspection:** | 56 Hrs | **Engines:** | 2 Turbo prop |
| **Airframe Total Time:** | 6094 Hrs as of last inspection | **Engine Manufacturer:** | Garrett AiResearch |
| **ELT:** | Installed | **Engine Model/Series:** | TPE331 SERIES |
| **Registered Owner:** | BRIGGS TOBACCO AND SPECIALTY COMPANY INC | **Rated Power:** | 904 Horsepower |
| **Operator:** | BRIGGS TOBACCO AND SPECIALTY COMPANY INC | **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:** | NQA,320 ft msl | **Distance from Accident Site:** | |
| **Observation Time:** | 10:50 Local | **Direction from Accident Site:** | |
| **Lowest Cloud Condition:** | Scattered / 500 ft AGL | **Visibility** | 3 miles |
| **Lowest Ceiling:** | Broken / 1200 ft AGL | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29.81 inches Hg | **Temperature/Dew Point:** | 12°C / 12°C |
| **Precipitation and Obscuration:** | N/A - None - Mist | | |
| **Departure Point:** | Millington, TN (NQA ) | **Type of Flight Plan Filed:** | IFR |
| **Destination:** | Millington, TN (2M8 ) | **Type of Clearance:** | IFR |
| **Departure Time:** | 10:40 Local | **Type of Airspace:** | Class D |

## Airport Information

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| **Airport:** | Millington Regional Jetport NQA | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 320 ft msl | **Runway Surface Condition:** | Wet |
| **Runway Used:** | 22 | **IFR Approach:** | None |
| **Runway Length/Width:** | 8000 ft / 200 ft | **VFR Approach/Landing:** | Full stop |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Minor | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Minor | **Latitude, Longitude:** | 35.356666,-89.870277(est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Cox, Paul |
| **Additional Participating Persons:** | Richard Sester; FAA/FSDO; Memphis, TN<br>Ralph Sorrells; Mitsubishi Heavy Industries America; Addison, TX<br>James Allen; Honeywell Aerospace; Phoenix, AZ |
| **Original Publish Date:** | October 21, 2010 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=69546 |