Aviation Investigation Final Report

Location:	WAYNE, Illinois	**Accident Number:**	CHI98FA074
Date & Time:	December 30, 1997, 17:05 Local	**Registration:**	N999WB
Aircraft:	Mitsubishi MU-2B-30	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane departed runway 1L and radar data indicated the airplane maintained about a 110 knot ground speed for 37 seconds as it climbed to 1,400 feet msl (642 feet agl) with a 008 degree heading. The last radar 14 seconds later indicated the airplane's heading was 342 degrees and had a 130 knot ground speed. The winds were 290/11. Witnesses reported seeing the airplane flying low and slow, and then it made a turn like a "barrel roll" to the left before impacting the ground. Examination of the engines and airframe revealed no pre-existent anomalies. The left and right propellers exhibited leading edge damage and chordwise abrasions. The pilot had a total of about 1,175 flight hours with about 250 hours in the type and model aircraft. The copilot had 4,094 total hours, but had 10 hours of turbine time and no flight time in the type and model of aircraft. The pilot had indicated he was practicing simulated single engine failures. The gear was fully retracted. The trim settings were set for a right engine out situation. The flap selector was set to "UP" flaps, but the flaps were found in transit at approximately 2 degrees of flaps. The Airplane Flight Manual indicated that during "Engine Failure in Takeoff-Gear Fully Retracted" stated that the required airspeed before selecting flaps to 5 degrees was 140 KCAS. The Pilot's Operating Handbook stated the flaps take approximately 31 seconds to retract from 20 to 0 flaps, or 21 seconds to retract from 5 to 0 flaps.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot in command failed to maintain control of the aircraft. A factor was the lack of experience of the pilot and copilot in the type and model of aircraft. An additional factor was the pilot did not follow the proper procedure when the flaps were raised before 140 knots was attained during a simulated single engine failure.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
2. (F) IMPROPER USE OF PROCEDURE - PILOT IN COMMAND
3. (F) LACK OF TOTAL EXPERIENCE IN TYPE OF AIRCRAFT - PILOT IN COMMAND
4. (F) LACK OF TOTAL EXPERIENCE IN TYPE OF AIRCRAFT - COPILOT/SECOND PILOT

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

History of Flight

On December 30, 1997, at 1703 central standard time, a Mitsubishi MU-2B-30, N999WB, operated by PVS International, Inc., was destroyed when it impacted the ground two miles north of the DuPage Airport, West Chicago, Illinois. The 14 CFR Part 91 flight had departed DuPage Airport on a local training flight and was in the local VFR flight pattern for runway lL. The commercial pilot and the commercial copilot received fatal injuries. Visual meteorological conditions prevailed and no flight plan had been filed. The flight was in contact with the local air traffic control tower at DuPage Airport.

A fuel lineman at the airport reported that he had put fuel in the airplane at approximately 1500 on December 30, 1997. He reported that the pilots had just pulled the airplane out of the hangar and were about to go flying. The fuel log indicated that 184 gallons of Jet A had been put on the airplane.

At 2153 (All times UTC), N999WB (9WB) departed Dupage Airport to the west.

At 2227, 9WB radioed O'Hare Approach and requested the GPS 1L approach at DuPage Airport.

At 2238, 9WB was cleared for the approach and was told to switch to DuPage Tower frequency.

At 2242:02, DuPage Tower cleared 9WB to fly the approach to 1L and cleared 9WB to land.

9WB landed on runway 1L and taxied back to 1L for another takeoff.

At 2248:11, 9WB stated, "And tower, uh, Whiskey Bravo. We'll be, uh, simulated single engine on the takeoff. Circle to land same runway."

At 2248:18, the tower reported, "Mitsubishi Nine Whiskey Bravo, roger. Your option left or right traffic."

At 2249:56, the tower cleared 9WB for takeoff from runway 1L.

At 2250:01, 9WB reported, "Cleared to go, Niner Whiskey Bravo, and we'll be in left traffic."

At 2251:48, 9WB reported, "And tower, we're going to continue upwind here a little bit."

At 2251:52, the tower reported, "Mitsubishi Nine Whiskey Bravo, roger. Runway one left.

You're cleared to land."

At 2251:56, 9WB responded, "Cleared to land one left, Niner Whiskey Bravo."

At 2256:25, 9WB reported, "And tower, Whiskey Bravo's on final, full stop."

At 2256:28, tower reported, "Whiskey Bravo is cleared to land runway one left."

At 2256:31, 9WB responded, "Cleared to land one left, Whiskey Bravo."

At 2257:58, the tower stated, "Nine Whiskey Bravo, say your destination."

At 2258:00, 9WB responded, "Nine Whiskey Bravo, would like to take it around, uh, two more times."

At 2258:04, the tower responded, "Nine Whiskey Bravo, no problem, sir. Taxi back."

At 2300:36, 9WB stated, "And tower, Niner Whiskey Bravo. We're ready to go one left."

At 2300:41, the tower stated, "Nine Whiskey Bravo, into position and hold one left. Traffic landing two eight."

At 2300:45, 9WB responded, "Niner Whiskey Bravo, in sight."

At 2301:24, the tower stated, "Nine Whiskey Bravo, left or right turn out approved or left or right traffic, your choice. Runway one left, cleared for takeoff."

At 2301:29, 9WB responded, "Okay, Niner Whiskey Bravo. We'll make it right traffic this time. Cleared to go one left, Niner Whiskey Bravo."

There were no further radio transmissions from 9WB.

Witnesses reported seeing an airplane flying northbound from DuPage Airport. They reported that the airplane appeared to be flying slow and at an altitude between 500 to 1000 feet above ground level (agl). They reported seeing the right wing go up as if turning left to the northwest, but then the airplane "barrel rolled" to the left and continued rolling straight down. None of the witnesses reported seeing the airplane impact the ground due to the trees in the area.

A witness who lived north of the impact site reported that, "As I lost sight of the plane into the trees, I noticed the left wing of the plane tilted upward, after which I heard a crash which sounded much like wood breaking."

One witness reported he heard the airplane fly near his house which was located about 1,000 feet to the east of the accident site. He reported that the airplane sounded very low and very

loud. He reported that the airplane noise did not sound normal. He reported that the loud noise made by the airplane continued until the airplane impacted the ground.

The airplane impacted the ground in a small pasture in a residential area. A witness who owned the property reported hearing the airplane as it flew over his house and when it impacted the ground. He reported that he ran out to the pasture to render assistance. He reported there was a heavy smell of fuel in the air. He reported there was a small fire near the right wing. He reported the flame was a single flame and about 10 inches in height. He reported the flame was extinguished with snow.

The witness reported that emergency response vehicles arrived at the scene about two minutes after the accident occurred. Although there was no fire, the fire department put water on the aircraft as a precaution.

Personnel Information

The pilot was a commercially rated pilot with single engine and multi-engine land ratings and a commercial helicopter rating. He held an instrument rating in airplanes. He was a Certified Flight Instructor in single and multiengine airplanes and was also an instrument instructor in airplanes. He was certified as an advanced ground instructor and as an instrument ground instructor.

The pilot's logbooks were not obtained. He had an estimated 1,175 total flight hours. Witnesses reported that he had about 350 flight hours in the MU-2. However, the pilot indicated on a pilot history form he filled out on October 10, 1997, when he went to flight training at Flight Safety, Houston, Texas, that he had a total of 1,175 hours, 866 hours as Pilot in Command, 80 hours in the last six months, and a total of 250 hours in MU-2's.

A witness reported that the pilot had received his private pilot and commercial pilot ratings at Southern Illinois University. The witness reported that the pilot obtained the single engine instructor rating and instrument instructor rating at American Flyers located at DuPage Airport, West Chicago, Illinois.

The pilot obtained his multi-engine instructor (MEI) rating in November, 1997. The pilot's MEI instructor pilot during his MEI training was the copilot of the accident flight. The copilot's logbook indicated that the pilot and copilot had flown together on seven instructional flights between July 9, 1997, and November 13, 1997. The airplane used for the MEI training was a twin engine Gruman Cougar. The pilots had flown together for 10.1 hours in preparation for the pilot's MEI checkride.

The operator of the airplane reported the pilot had started flying in the right seat of the airplane in September 1995. The pilot flew as copilot in order to build flight time and was not paid while flying as copilot. The operator reported that the pilot had flown about 150 hours as copilot. In September 1996, the pilot started to fly as Captain on the MU-2. The operator

reported that the pilot had flown 180 to 200 hours as Captain.

The operator purchased a "Full Service" training contract for the pilot through Flight Safety International, Houston, Texas. The full service contract allowed the pilot to obtain his initial ground school and flight simulator training, and subsequent recurrent ground school and simulator training at Flight Safety. The pilot received his initial training in October 1996. The pilot completed his first recurrent course in April 1997. The pilot completed his second recurrent course in June 1997. The pilot completed his third recurrent course on October 10, 1997. While attending Flight Safety, all of the pilot's flight training was conducted in Flight Safety's MU-2 flight simulator. The pilot did not fly with the Flight Safety instructors in an actual airplane. The pilot's most current Biennial Flight Review and Instrument Competency Check was accomplished in Flight Safety's MU-2 flight simulator on October 10, 1997.

The pilot also attended the MU-2 maintenance course offered by Flight Safety. The pilot attended the maintenance course on MU-2 systems from June 2 to June 12, 1997, for a total of 54 instructional hours.

The copilot was a commercial pilot with single and multi-engine land and instrument ratings. He was a Certified Flight Instructor in single and multiengine airplanes and was also an instrument instructor in airplanes. He was certified as an advanced ground instructor and as an instrument ground instructor. He was a designated FAA ASC (Air Safety Counselor).

The copilot had a total of approximately 4,094 flight hours. 772 hours were in multi-engine airplanes. He had flown approximately 10 hours in multi-engine turbine airplanes. The copilot's logbook indicated that he had not flown an MU-2 before the accident flight.

Aircraft Information

The airplane was a twin engine Mitsubishi MU-2B-30, serial number 530. The airplane seated eight and had a gross weight of 10,800 pounds. The engines were 665 shaft horsepower Allied Signal TPE 331-1-151A engines. The last 100 hour maintenance inspection was conducted on June 20, 1997. The airplane had flown approximately 86 hours since the last inspection and had a total time of 6,275 hours.

The engine logbooks indicated that both engines were overhauled on January 26, 1979. The time since overhaul was about 3,141 hours. A hot section inspection was conducted on February 9, 1988. The time since the hot section inspection was about 1,892 hours.

The propeller logbooks indicated the Hartzell propellers, model HCB3TN-5E, were overhauled on June 20, 1994. The time since overhaul was about 404 hours.

A review of the airplane's logbooks indicated that all Airworthiness Directives (AD's) had been complied with.

Meteorological Conditions

At 1655, weather conditions reported at DuPage Airport were VFR. The sky was overcast at 7,500 feet with 10 mile visibility. The temperature was 22 degrees Fahrenheit and the Dew Point was 14 degrees Fahrenheit. The wind direction was 310 degrees at 7 knots. The altimeter was 29.74.

Wreckage and Impact Information

The airplane wreckage was located about 2 statute miles north of the DuPage Airport. The National Transportation Safety Board Investigator-In-Charge (IIC) arrived at the accident site at approximately 1835 on December 30, 1997. The extraction of the pilots from the wreckage was authorized by the IIC. During the extraction of the copilot from the wreckage, the copilot's left hand was observed to be on and in front of the power lever knobs.

The airplane impacted in a small pasture in a residential area. The pasture's terrain was flat with trees and shrubs to the north of the impact site and a small pond to the southeast of the site. A small open pasture was located to the southwest of the wreckage. There were no indications that the airplane had hit any of the trees in the area of the wreckage site prior to impacting the ground.

The wreckage indicated the airplane impacted the ground in about a 55 to 75 degrees nose down attitude. The aircraft wreckage heading was 065 degrees magnetic.

The airplane did not travel forward after impact. The right engine, right propeller, and the right wing remained virtually in place after they impacted the ground. The right wing had leading edge crush damage along its entire length. The right wing tip had additional crushing and buckling on approximately the two foot outboard section of the wing. The right wing separated from the fuselage and the rest of the wing at the wing attach fittings at the right wing root. The right engine and propeller were buried in about four to five feet of soft clay soil. The right wingtip tank separated from the right wing and the nose of the wingtip tank was buried in about two to three feet of soft clay near the pond.

The left wing was found with leading edge crush damage along its entire length. The left propeller had separated from the left engine and was found about four feet forward of the left engine with two blade tips exposed and the rest of the propeller buried in about six inches to 1.5 feet of sand and clay soil. The left engine had partially separated from the left wing, and the engine and accessory gear box were partially separated from each other. The wing attach fittings for the left wing were broken. The left wingtip fuel tank separated from the left wing and was located about 30 feet aft and to the left of the left wingtip. An outboard section of left wing flap was found about 40 feet aft and to the left of the left wingtip.

A small tree and bushes in front of the left wing, and a small fence about six feet forward of the left wing and engine exhibited evidence of impact. A propeller slash was evident in a wood

post, and a metal fence post was bent over to the south and broken in two from impact.

The fuselage received extensive crushing and buckling during the impact. The nose landing gear was buried in about four feet of clay. The cockpit and cabin area back to the overhead wing root was crushed and destroyed during impact. The fuselage between approximately Fuselage Station (FS) 7250 and FS 8325 had buckled and separated, exposing the environmental control unit. The empennage separated from the fuselage at the fuselage break ring at FS 8895.

The vertical stabilizer had partially separated from its fuselage attach fittings and was laying horizontally to the right. The vertical stabilizer's leading edge was dented between Vertical Stabilizer Station (VS) 1500 and 2190. The rubber boot at that location was torn and pieces of rubber boot were missing.

The left horizontal stabilizer remained attached to the empennage. It did not exhibit leading edge damage or buckling or crushing of the surface.

The right horizontal stabilizer remained attached the empennage. The section of the stabilizer and elevator outboard of Horizontal Stabilizer Station (HS) 1480 exhibited leading edge crush and horizontal crushing and buckling.

The upper surface of the aft cowling ("Boat tail") of the right engine was dented and exhibited a transfer of black material onto the engine cowling. Pieces of the black rubber deice boot material were found near the right engine cowling and wing.

The control cables were checked for continuity. The cables from the cockpit to the rudder, elevator, spoilers, and trim surfaces exhibited continuity.

The spoiler and elevator control columns were examined for continuity. The spoiler chain was twisted and had open links, but was attached to both yoke sprockets and exhibited continuity to the cable quadrant. The right control yoke and control shaft assembly had separated from the column assembly.

The landing gear was found in the fully retracted position. The landing gear traveling nut was at the full aft position indicating landing gear up. The gear position switch in the cockpit was in the up position.

The flap position was determined to be between 0 and 5 degrees of flaps. The traveling nut of the flap position mechanism measured about 25.4 mm from the full up position, which equated to about 1.75 to 2 degrees of flaps. All the flap jackscrews for the inboard and outboard flaps indicated mid-travel between 0 to 5 degrees of flaps.

The rudder trim was determined to be about 10 degrees nose left trim. The rudder trim indicator in the cockpit was aligned with the 10 degrees nose left position. The rudder trim tab

was offset to the right of the rudder approximately 5 to 10 degrees. The cables to the rudder trim were not broken during the impact.

The trim ailerons indicated that the right wing trim ailerons were positioned about 10 degrees down, and the left wing trim ailerons were positioned up. The right and left trim aileron actuators' extensions indicated the left trim aileron in the up position, and the right trim aileron in the down position.

The elevator trim was observed in the neutral position. The elevator trim indicator in the cockpit was aligned with the zero trim position. The elevator trim was not offset from the trailing edge of the elevator. The cables to the elevator were not broken during the impact.

The four fuel shutoff valves were found in the open position. The emergency fuel shutoff (fire pull handles) were not pulled.

The throttle quadrant of the central pedestal was examined. The two power levers were found in the full forward or "TAKEOFF" position. The two condition levers were found in the full forward or "TAKEOFF LAND" position.

The throttle quadrant power lever cover plate was examined. The underside of the cover was scraped approximately halfway between the "FLIGHT IDLE" and "TAKE OFF" positions, on the right hand side. The scrape was approximately half an inch long and 0.2 inches wide. It began as a light scrape mark on the end closest to the "FLIGHT IDLE" position, but ended abruptly on the end closest to the "TAKE OFF" position.

Another scrape was evident approximately three quarters of the way between the "FLIGHT IDLE" and "TAKE OFF" positions, on the right-hand side. The scrape was approximately 0.8 inches in length, and extended from the edge approximately 0.2 inches in width. The end of the scrape nearest to the "FLIGHT IDLE" location began as a light scrape mark, while the other end appeared deeper and ended abruptly.

There were no scrapes on the underside of the left side of the power lever cover plate.

The throttle quadrant power lever cam surface contained damage on both sides, located approximately three quarters of the way between the "FLIGHT IDLE" and "TAKE OFF" positions. The major damage on the right side consisted of a sharp depression, followed by some scraping in the direction of the "TAKE OFF" position. The material coating had been removed in this scraped area, exposing the base material. The damage on the left side at this location consisted of two parallel impressions, about 0.1 inches in length and space approximately 0.1 inches apart. The base material had been exposed at the impression and in between. A small amount of scraping was present along the outside edge of the cam on both sides of the impression.

The throttle quadrant cam surface revealed additional scraping along the right side of the cam

at approximately halfway between the "FLIGHT IDLE" and "TAKE OFF" positions, and along the outside edge of the cam between this damage and the damage found approximately three quarters of the way between the "FLIGHT IDLE" and "TAKE OFF" positions. (See photograph 17)

The flap position selector was found in the "UP" position. The selector housing was crushed around the flap selector at impact.

The trim position indicators revealed that the elevator trim was set at zero degrees. The rudder was set at approximately 10 degrees nose left. The trim aileron indicated zero degrees, however, the trim aileron was electrically actuated and always went to zero when electrical power was off.

The right engine cowl was crushed and deformed with multiple wrinkles. The deformation had dislodged paint from the top of the wrinkles. Sooting covered both the painted surfaces and the unpainted adjacent wrinkles evenly, indicating the sooting occurred after the deformation, i.e. a post-crash fire.

Medical and Pathological Condition

Autopsies were performed on the pilot and copilot at the DuPage County Coroner's Office, Wheaton, Illinois.

Forensic Toxicology Fatal Accident Reports were prepared by the FAA Civil Aeromedical Institute. The reports on the pilot and copilot indicated negative results.

Tests and Research

The Allied Signal TPE 331-1-151A engines were inspected at the engine manufacturer's repair and overhaul facility. The results of the inspection revealed that the type and degree of damage was indicative of engine rotation and operation at the time of impact with the ground. No pre-accident conditions were found on either engine which would have interfered with normal operation. (See Allied Signal Engine Report)

The left and right propeller governors and the left and right fuel control units were inspected at Woodard Governor. The examination of the propeller governors revealed that there was no anomaly that precluded normal operation prior to impact.

The right fuel control unit (FCU) was bench tested. Results of the test indicated the FCU commanded fuel in the appropriate direction. The fuel schedules shifted, but all functions were operable. Flight idle was observed to be operable, and at a level necessary to sustain combustion. Upon disassembly, all damage noted was determined to be caused by the impact.

The left FCU was damaged beyond test conditions. Upon disassembly, all damage noted was

determined to be caused by the impact. The examination of the FCU revealed that there was no anomaly that precluded normal operation prior to impact. (See Woodard Governor Engineering Analytical Report)

The propellers were three bladed Hartzell propellers. The inspection of the left propeller revealed that all blades were complete except for the L1 blade which was missing about 1/2 inch of the tip end. The L1 blade had chordwise abrasions on the camber side. The blade was twisted about 10 - 15 degrees towards the low pitch direction. The leading edge was dented and gouged, and a large triangular shaped gouge (about 3/16 inch deep) was located about 14 inches from the tip end. The tip end was twisted off towards the face side of the blade.

The L2 blade exhibited had chordwise abrasions on the camber side and it exhibited an "s" bend. The tip end was slightly twisted towards the low pitch direction. Leading edge damage was present but was less severe that noted on blade L1.

The L3 blade had a very slight "s" bent on the outboard section of the blade. There was no significant leading edge damage.

The right blade R1 was not significantly impact bent or twisted. The leading edge was severely dented and gouged from the tip inboard to about the mid-blade area. Chordwise marking were found on the camber side of the blade.

The R2 blade had separated out of the clamp assembly. It was bent rearward about 15 degrees and twisted slightly towards the low pitch direction from the approximate mid-blade area. Leading edge damage was light.

The R3 blade had no significant bend or twist. There was no significant leading edge damage. (See Propeller Teardown Report)

The fuel recovered from the right engine fuel control unit during the inspection at Woodard Governor was analyzed. It was determined to be Jet-A fuel.

Fuel samples taken from the truck that fueled the accident aircraft prior to takeoff were analyzed. The samples met the measured commercial requirements for Jet-A aviation turbine fuel.

The airplane's KLN90B GPS was examined. The examination revealed there was no memory or voltage, and that no data could be recovered from the unit.

Additional Information

The operator of the airplane reported that the pilot was scheduled to fly him to Florida within two weeks. The operator reported that he did not know that the pilot would be practicing his flying proficiency on the day of the accident. He reported that he had given the pilot

authorization to perform proficiency flights in the past, and it was not unusual for the pilot to be flying the airplane without the operator's specific knowledge.

The previous Captain for the operator on N999WB reported that he had flown with the accident pilot numerous times in N999WB. He reported they had practiced simulated single engine failures in the pattern. He reported that the pilot had performed the procedures fine. He reported that he and the pilot had secured an engine in the air, and the pilot had performed an engine air start.

The previous Captain reported that he had talked to the pilot about four hours prior to the accident. He reported the pilot said he was going to practice single engine work and practice takeoff and landings. The witness reported the pilot did not say that he was taking anyone with him on the flight.

A witness who was a co-owner of twin engine Gruman Cougar with the copilot reported that it was just "happenstance" that the pilot and copilot were flying together that day. He reported that the copilot had not flown the MU-2 before. He reported that the copilot was a very conservative pilot, and would not put himself in a position that was beyond his capabilities.

At 2153, 9WB departed the DuPage Airport to the west. 9WB returned to the DuPage Airport and the pilot requested the GPS 1L approach from O'Hare Approach. The airplane was cleared for the approach, landed, and taxied back to 1L for another takeoff.

At 2248:11, 9WB transmitted to the tower air traffic controller (ATC), "And tower, uh, Whiskey Bravo, we'll be, uh, simulated single engine on the takeoff. Circle to land same runway."

At 2248:18, the tower responded, "Mitsubishi Nine Whiskey Bravo, roger. Your option left or right traffic."

At 2248:22, 9WB responded, "Whiskey Bravo."

At 2248:24, the tower reported, "And Nine Whiskey Bravo, the wind, uh, two niner zero at one one."

At 2249:52, 9WB reported, "and tower, Niner Whiskey Bravo. We're ready at, uh, one left."

At 2249:56, the tower responded, "Mitsubishi Nine Whiskey Bravo, left or right traffic runway one left. Cleared for takeoff."

At 2250:01, 9WB reported, "Cleared to go, Niner Whiskey Bravo, and we'll be left traffic."

The FAA's Chicago TRACON located in Elgin, Illinois, recorded radar data of N999WB as it flew its left traffic pattern at DuPage Airport. The approach radar recorded a "hit" every 4 to 5 seconds from 9WB's transponder that was set to the code 1200. No other aircraft were in the

traffic pattern at DuPage Airport. The lowest radar hit was recorded at 1,000 mean sea level (msl). The airport elevation at DuPage Airport was 758 feet msl.

At 2251:18, the radar data indicated that 9WB had departed DuPage Airport and had climbed to 1,000 feet msl or 242 feet above ground level (agl).

Between 2251:23 and 2251:32, the radar indicated the ground speed had reached 120 knots and reached at altitude of 1,200 msl.

Between 2251:36 and 2252:13, the radar indicated the ground speed had slowed to 110 knots, and the airplane climbed from 1,300 to 1,600 feet msl.

At 2251:48, 9WB transmitted to the tower, "And tower, we're going to continue upwind here a little bit."

At 2251:52, the tower transmitted, "Mitsubishi Nine Whiskey Bravo, roger. Runway one left. You're cleared to land."

At 2251:56, 9WB responded, "Cleared to land one left, Niner Whiskey Bravo."

At 2252:18, 9WB's ground speed and altitude steadily increased from 120 knots and 1,600 feet to 200 knots and 2,100 feet, respectively, when it was on a left downwind at 2254:00. The airplane continued its approach and landed without incident on runway 1L.

At 2258:00, 9WB indicated that it would do two more takeoff and landings. 9WB did not specify if a simulated single engine failure would be performed during the two additional takeoff and landings.

At 2301:24, the tower cleared 9WB for takeoff with a choice of left or right downwind.

At 2301:29, 9WB reported, "Okay, Niner Whiskey Bravo. We'll make it right traffic this time. Cleared to go one left, Niner Whiskey Bravo."

At 2302:23, the radar data indicated 9WB had climbed to 1,200 feet msl and had a ground speed of 110 knots.

Between 2302:23 and 2303:00, the 9WB's ground speed remained at 110 knots and the altitude increased to 1,400 feet msl, or 642 feet agl.

At 2303:05 and 2303:10, the radar data indicated 9WB's ground speed was 120 knots at 1,400 feet msl and heading 001 degrees.

The last radar hit at 2303:14, indicated 9WB's ground speed increased to 130 knots at 1,400 feet msl. The heading was 342 degrees.

During the on-site investigation, 9WB's trim settings indicated the following: (1) Rudder trim indicated approximately 10 degrees nose left trim. (2) The trim ailerons indicated right trim aileron down and left trim aileron up. (3) Elevator trim was neutral.

The flap selector was found in the UP position, but the flaps were in a transit position of approximately 2 degrees of flaps.

The Mitsubishi MU-2B-30 Pilots Operating Manual stated in the Flight Control section of the Systems Description the following information regarding flap retraction times: "Flap retraction times are approximately as follows: 40 to 20 degrees is 4 seconds; 20 to 5 degrees is 10 seconds; and 5 to UP is 21 seconds."

The Mitsubishi MU-2B-30 Airplane Flight Manual indicated in the BEFORE TAKEOFF checklist that the normal flap position for takeoff was 5 or 20 degrees.

The landing gear was found in the fully retracted position.

The Mitsubishi MU-2B-30 Pilots Operating Manual stated in the Flight Control section of the Systems Description that landing gear retraction and extension times are approximately 17 seconds in either direction.

The AFTER TAKEOFF procedure in the Normal Procedures section of the Mitsubishi MU-2B-30 Airplane Flight Manual stated the following:

1. Maintain pitch attitude 13 degrees Nose UP maximum. When positive rate of climb is established

2. Landing Gear UP

3. Airspeed 120 KCAS (5 degree Flap Takeoff)
115 KCAS (20 degree Flap Takeoff)

4. Flaps - After gear retraction complete

a. 20 degrees Flap Takeoff TO 5 degrees b. 5 degree Flap Takeoff TO UP

NOTE:

It is recommended to set the flap switch at 5 degrees position and confirm 5 degree indication light before selecting the UP position.

The ENGINE FAILURE IN TAKEOFF CLIMB - GEAR FULLY RETRACTED procedure in the

Emergency Procedures section of the Mitsubishi MU-2B-30 Airplane Flight Manual stated the following:

1. Airspeed	140 KCAS MINIMUM
2. Flaps	5 degrees
3. Failed Engine Condition Lever	EMERGENCY STOP
4. Failed Engine Power Lever	TAKEOFF

WARNING

Identify failed engine by power asymmetry and engine instruments. Do not retard failed engine power lever. Place failed engine power lever to takeoff position during feathering of propeller and leave there for the remainder of the flight.

CAUTION

Run-Crank-Stop Switch must remain in RUN position.

5. Flaps	UP
6. Airspeed	150 KCAS
7. Operating Engine Power	As Required

WARNING

Air Conditioning and Pressurization System must remain OFF to attain full climb capability.

8. Engine Shutdown Procedure	Complete

NOTE

Single engine climb rates are best attained with wings level by use of rudder to correct for yawing tendency and using minimum amount of spoiler necessary to maintain lateral control.

Flap Setting	Vxse (KCAS)	Vyse (KCAS)
0 degrees	140	150*
5 degrees	130	140

20 degrees 125 135

*Vyse, Maximum Takeoff Gross Weight , Sea Level Standard Day, Flaps 0 degrees is 152 KCAS. 150 KCAS is recommended for all weights.

The Operating Limitations section of the Mitsubishi MU-2B-30 Airplane Flight Manual indicated the following airspeed limitation:

Vmc (Minimum Control) (Flaps 5 degrees) 99 (Flaps 20 degrees) 90

The aircraft manufacturer calculated that the Vmc for Flaps 0 degrees to be 111 knots. This calculation was based on the airplane configuration of gear up, flaps up, maximum aft c.g., gross weight, and one engine/propeller set to zero thrust.

The MU-2 flight simulator (training device) at Flight Safety, Houston, Texas, was used to simulate the flight profile of the accident aircraft and to provide an indication of the flight tendencies of the aircraft.

A normal takeoff was initiated using power settings (40 psi) which most closely matched the radar flight profile speed/climb data. After a positive rate of climb, the landing gear lever was selected to "UP." At approximately 300 to 400 feet agl and about eight seconds after the gear was selected to "UP," the power on the right engine was brought back to "zero thrust."

Directional control was maintained by application of the left spoiler up (control wheel to the left) and application of left rudder as required. Left rudder trim was set to remove the yaw force on the rudder pedals and left wing down trim (trim aileron) was applied to remove spoiler drag and straighten the control wheel. (Approximately 10 degrees of left rudder and 1/2 of trim aileron available was required.)

Airspeed indicated about 110 knots and slowly accelerated. Rate of climb was approximately 100 ft/min. An altitude of 400 to 500 feet agl was obtained.

Raising the flaps from 20 degrees to zero degrees and adding a sudden application of power to 40 psi on the right engine by moving the right power lever forward resulted in a left turn of approximately 40 degrees and a 45 to 50 degree angle of bank to the left. A 20 to 40 degree nose down pitch was observed.

Two scenarios caused the simulator aircraft to turn back to the right. The first sequence involved turning the control wheel hard to the right to counteract the induced left roll while pulling back on the yoke. It resulted in a 90 to 105 degree roll back to the right and a 45 to 55 degree nose down pitch.

The second sequence involved pulling back the right power lever to flight idle after the aircraft

entered the 40 degree left angle of bank and 20 to 40 degrees nose down pitch. The aircraft rolled back to the right and the nose pitched down.

The parties to the investigation were the Federal Aviation Administration, Mitsubishi Heavy Industries America, Inc., Allied Signal Aerospace, Hartzell Propeller Inc., and the Woodard Governor Company.

The aircraft logbooks, maintenance records, and aircraft wreckage were released to Howe Associates, Inc.

Pilot Information

Certificate:	Commercial	**Age:**	28,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	August 25, 1997
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	1175 hours (Total, all aircraft), 250 hours (Total, this make and model), 866 hours (Pilot In Command, all aircraft), 13 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mitsubishi	**Registration:**	N999WB
Model/Series:	MU-2B-30 MU-2B-30	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	530
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	June 20, 1997 Annual	**Certified Max Gross Wt.:**	10800 lbs
Time Since Last Inspection:	86 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	6275 Hrs	**Engine Manufacturer:**	Garrett
ELT:	Installed	**Engine Model/Series:**	TPE-331-1-151
Registered Owner:	PVS INTERNATIONAL, INC.	**Rated Power:**	665 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/bright
Observation Facility, Elevation:	DPA ,758 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	16:55 Local	**Direction from Accident Site:**	180°
Lowest Cloud Condition:	Unknown	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 7500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	22°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WEST CHICAGO , IL (DPA)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	VFR
Departure Time:	21:48 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	DUPAGE DPA	**Runway Surface Type:**	Asphalt
Airport Elevation:	758 ft msl	**Runway Surface Condition:**	
Runway Used:	1L	**IFR Approach:**	
Runway Length/Width:	5100 ft / 100 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	41.949966,-88.260818(est)

Administrative Information

Investigator In Charge (IIC):	Silliman, Jim
Additional Participating Persons:	TOM DUELLMAN; WEST CHICAGO , IL RALPH SORRELLS; DALLAS , TX DAVID LOOPER; PHOENIX , AZ ROGER STALLKAMP; PIQUA , OH
Original Publish Date:	April 15, 1999
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=10727