Aviation Investigation Final Report

Location:	Hillsboro, Oregon	**Accident Number:**	SEA05FA105
Date & Time:	May 24, 2005, 17:52 Local	**Registration:**	N312MA
Aircraft:	Mitsubishi MU-2B-25	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Witnesses observed the aircraft perform a rolling takeoff and it was airborne by the crossing runway (1,300 feet down the 6,600 foot runway). The aircraft entered an approximate 40 degree nose high climb rate to about 1,000 feet. The aircraft then entered a steep left hand banking turn. The nose dropped and the aircraft rotated up to about 4 times before colliding with the flat terrain adjacent to the departure end of the runway threshold. On site documentation of the airframe found no evidence of a flight control malfunction. An engine examination and teardown found that the gearbox section of the left engine experienced a high cycle fatigue failure of the high speed pinion journal bearing oil supply tube and subsequent degradation of the high speed pinion journal bearings. This failure resulted in a partial power loss to the left engine. The pilot had recently purchased this aircraft and he had accumulated approximately 11 hours since the purchase. The pilot had stated to personnel at the place where he purchased the aircraft that he had not received, nor did he need recurrent training in this aircraft as he had several thousand hours in the aircraft. Flight logs provided by the family indicated that the pilot had accumulated about 551 hours in a Mitsubishi, however, the last time that the pilot had flown this make and model was 14 years prior to the accident. Logbook entries indicated that only a few hours of flight time had been accumulated in all aircraft during the approximately 2 years prior to the accident. Personnel that flew with the pilot in the make and model aircraft involved in the accident described the pilot as "proficiency lacking." Normal takeoff calculations for the aircraft with the flaps configured to 5 degrees, indicated a ground run of 2,900 feet, with a rotation speed of 106 KCAS, and 125 KCAS for the climb out. A maximum pitch attitude of 13 degrees maximum is indicated. Performance calculations indicated that the aircraft was capable of lifting off where the witnesses observed and climbing to 1,000 feet agl by the end of the runway. To achieve this performance the aircraft would have rotated at approximately 84 KCAS and climbed at an airspeed below Vmc (100 KCAS) and close to power-off stall speed (86 KCAS) with 5 degrees of flaps. The airplane's flight manual indicated that if an engine failure occurs in the takeoff climb and the landing gear is fully retracted, the emergency procedures is to maintain 140 KCAS, flaps to 5 degrees, the

failed engine condition lever to EMERGENCY STOP, and failed engine power lever to TAKEOFF. On site documentation found the left side condition lever in the takeoff/land position and the power lever was found half-way between takeoff and flight idle.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to obtain minimum controllable airspeed during the takeoff climb, which resulted in a loss of aircraft control when the left engine lost partial power. A fatigue failure to an oil tube, which resulted in the partial power loss to the left engine, procedures/directives not followed by the pilot, and the pilot's lack of recent experience and no recurrent training in the type of aircraft were factors.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (F) LUBRICATING SYSTEM,OIL TUBING - FATIGUE
2. 1 ENGINE - FAILURE,PARTIAL

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
3. (C) AIRSPEED(VMC) - NOT OBTAINED - PILOT IN COMMAND
4. (F) LACK OF RECENT EXPERIENCE IN TYPE OF AIRCRAFT - PILOT IN COMMAND
5. (F) PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND
6. (F) INADEQUATE RECURRENT TRAINING - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. TERRAIN CONDITION - OPEN FIELD

Factual Information

HISTORY OF FLIGHT

On May 24, 2005, at 1752 Pacific daylight time, a Mitsubishi MU-2B-25, N312MA, registered to Max Aviation Inc. and operated by the pilot as a 14 CFR Part 91 personal flight, collided with the terrain shortly after takeoff from Portland-Hillsboro Airport, Hillsboro, Oregon. Visual meteorological conditions prevailed at the time and no flight plan was filed. The aircraft was substantially damaged and the commercial pilot and his three passengers were fatally injured. The flight was departing for Salem, Oregon.

Several witnesses were around or on the airport at the time of the accident. One witness, a commercial pilot located in his office near the southwest side of runway 30, stated that he observed the aircraft land on runway 30, and then turn off about 1,320 feet from the end of the runway at the crossing runway. The aircraft was seen to taxi to Hillsboro Aviation where both engines were shut down. A short time later, this witness observed the aircraft make a tight turn-around between two rows of aircraft, and then proceed directly to runway 30 without stopping and roll onto the runway and take off. The witness stated that the flaps were down and that the aircraft was airborne by the crossing runway. After the aircraft rotated, he observed the aircraft in a steep climb angle. The aircraft gained an altitude of about 1,000 feet above ground level (agl) when the pitch attitude of the aircraft lowered slightly for a second before the aircraft entered a left hand turn that did not appear to be coordinated as the nose was pointing more towards the west, but the aircraft's flight path continued along the general direction of the runway heading. The witness stated that it was obvious that right rudder was applied as the nose of the aircraft came back to the right, however the pitch attitude did not change. The wings then rolled left to the vertical position with the left wing down and the aircraft then completed two left hand spins. The witness did not see the ground impact.

Another witness, also a pilot, and driving westbound on Evergreen Parkway northeast of the departure end of runway 30, stated that he observed the aircraft just at liftoff with a steep climb angle of about 40 degrees nose up. He stated that the aircraft attained an altitude of about 1,000 feet agl when the aircraft turned to the west (left). The left banking turn continued and the wings went vertical with the ground (left wing down). The bank continued until about 120 degrees of bank and the aircraft went into a four-turn spin to the left. The witness stated that the landing gear had been retracted, however, he does not recall the position of the flaps. He stated that both propellers were turning at the time.

Other witnesses at various positions around the airport observed basically the same circumstances as the previous two witnesses. Some however reported hearing a "bang", "popping" or "distinct noise from the engine(s)." The witnesses reported one to four spin rotations of the aircraft before collision with the ground.

PERSONNEL INFORMATION

A review of the pilot's airmen and medical records obtained from the Federal Aviation Administration (FAA) found two separate sets of airmen and medical records for this pilot. The first set of airmen and medical records indicated the pilot's first name as "Michael" with a social security number ending in 0866 and a FAA designated certificate number. The records indicated that the pilot was issued a private pilot certificate on August 2, 1967, with 42 hours of dual flight time, and 10 hours of solo time. The pilot was issued a commercial certificate for single-engine land operations on March 28, 1968, with 100 hours of pilot-in-command (PIC) time, and 63 hours of dual flight time. An instrument rating was issued on March 16, 1970, with 116 hours of PIC time; 63 hours of instrument flight, and 111 hours of dual flight time. The commercial, multi-engine land rating was issued on September 12, 1973, with 427 hours of PIC time, and 138 hours of instruction. The multi-engine check ride was in a Piper PA 34-200 aircraft.

On January 15, 1974, during the issuance of a FAA Class II medical certificate, the pilot reported a total flight time of 3,000 hours, with 60 hours in the preceding six months. On subsequent FAA medical certificates issued in December 1975, the pilot reported 3,500 flight hours; in January 1978, reported 6,000 flight hours; in March 1980, reported 4,600 flight hours, and in August 1982, reported 5,000 flight hours.

In 1980, the pilot's commercial certificate was under suspension for several regulation violations and was subsequently revoked in January 1985.

In 1987, the pilot re-applied for his flight certificates indicating a first name of "Mychal" and a social security number different from his original social security number with the last four digits ending in 0688 instead of 0866. The private and commercial certificate for single engine land aircraft were issued via a Designated Examiner. The airmen documents indicated that the examiner checked the box indicating that, "I have personally reviewed this applicant's pilot logbook and certify that the individual meets the pertinent requirements of FAR 61 for the pilot certificate or rating sought." The record of pilot time indicated a total flight time of 1,480 hours, with 1,305 hours as pilot-in-command. The flight check was accomplished in a Rockwell Commander 112TC aircraft.

Two weeks later, via the same Designated Examiner, the pilot was issued a commercial airplane multi-engine land rating. The examiner checked the same box indicating that he reviewed the pilot's flight logbook. The flight time indicated 1,482 hours of total flight time with 1,307 hours as pilot-in-command. The check ride was accomplished in a Beech BE-76 aircraft.

Medical records for this pilot name of "Mychal" show he was issued a class III medical certificate in September 1986. No flight time was indicated at this time and no previous records for this name or social security number were found.

The pilot did not apply for an instrument rating under the name of "Mychal". The pilot's commercial flight certificate indicates, "Carrying passengers in airplanes for hire is prohibited at night and on cross country flights of more than 50 nautical miles."

Subsequent medical records indicated:

May 1989, a total flight time of 7,500 hours with no time indicated in the preceding six months.
January 1991, the pilot indicated 13,000 hours of flight time with 50 hours in the preceding six months.
July 1995, the pilot indicated 17,000 hours of flight time and five hours in the preceding six months.
August 1997, the pilot indicated 17,000 hours of flight time with 50 hours in the preceding six months.
October 1999, the pilot indicated 17,000 hours of flight time with 50 hours in the preceding six months.
April 2002, the pilot indicated 17,300 hours of flight time, with 50 hours in the preceding six months.
August 2004, during the most current class II medical and current at the time of the accident, the pilot indicated 17,500 hours of flight time, with 10 hours in the preceding six months.

A member of the pilot's family (step-daughter) was able to confirm the original social security number ending in 0866 and the pilot's first name spelled "Michael" on his birth certificate. Addresses and other personal data were the same on both records. The step-daughter had no record that the pilot had changed his social security number nor was she aware of the reason for the spelling change of his first name.

A further review of airmen records indicated that the pilot, under the certificate name of "Mychal", was involved in a gear-up landing incident in a Mitsubishi MU-2B, N100CF, on March 26, 1991. Members of the pilot's family reported that this aircraft was owned by the pilot at the time. After repairs were made, the aircraft was sold sometime in 1992. This was the last time the pilot had flown a Mitsubishi MU-2, until the accident aircraft was purchased in April 2005.

At the time of the accident, a log found in the wreckage indicated that the pilot had accumulated a total flight time of 11.3 hours since its purchase. Individuals who encountered the pilot at the time of the purchase, had discussed with the pilot and recommended that he accomplish recurrent flight training in the aircraft. The pilot indicated to these individuals that he had owned Mitsubishi's before and had several thousand hours in the aircraft and did not need any recurrent training.

On April 24, the pilot was picked up at the Tulsa, Oklahoma, airport by the Customer Service manager and maintenance flight check pilot for Intercontinental Jet Corp. This company had just completed some maintenance items on the aircraft in preparation for the purchase and acceptance of the aircraft by the pilot. The manager stated that when he flew with the pilot

during the after maintenance check flight, he stated that the pilot was "proficiency lacking," and needed guidance on the checklist and power settings. He stated that the pilot's landings were ok, but he could not fly the aircraft and operate the radios at the same time. The manager stated that due to concerns with the pilot's proficiency in the aircraft, he flew back to Oregon with the pilot. During the flight, the manager reported that the pilot had difficulty controlling the aircraft in marginal weather conditions, and at one point had to be coached like a "student pilot."

The pilot's son was able to locate several flight logbooks, which were provided to the NTSB IIC for review. The flight records began in 1967, and continued with steady flight time logged each year up to 1981. By May of 1981, the logbooks indicated a total flight time in all aircraft of about 1,923 hours. In 1974, the first entry of flight in a MU-2 was logged. Approximately 51 hours were logged in a MU-2 from 1974 to 1975. The next indication of flight time in a MU-2 was logged in 1979 to 1981. Approximately 292 hours were logged in this time frame.

From 1981 to 1987, only a few hours of flight time were logged. In April - May 1987, entries in the log book indicated the renewal of the private/commercial certificates for single and multi-engine land aircraft. No logged flight time was indicated from May of 1987 to July 1989. At this time, the pilot purchased a MU-2, N100CF and received 3.2 hours of "familiarization" flight with a flight instructor, and 2.1 hours for a flight review. Total time in all aircraft was about 2,015 hours. From the time of purchase to September 1991, the pilot logged 197 hours in this aircraft. The aircraft was sold after the pilot made a gear-up landing.

No flight time was logged from September 1991 to September 1996. In September 13 to 27, 1996, the pilot logged 6.4 hours in a Cessna 177RG. No flight time was logged again until March 11, 1998, when the pilot was signed off for a flight review. The logbook did not indicate the aircraft type or amount of flight time. The next entry was another sign-off for a flight review in August 2004, by the same flight instructor from the previous flight review. Again, the logbook did not indicate the type of aircraft or amount of flight time. The flight instructor that gave the pilot his most recent flight review on August 12, 2004, was interviewed by the NTSB IIC. The instructor reported that a Cessna 182 was rented for the approximate one hour flight. The flight instructor stated that the pilot's flight proficiency was good for not having flown in one, maybe two years. The pilot's knowledge of the air traffic system and ground operations were weak, however, after about two hours of discussion, the pilot passed the flight review. The instructor stated that they only discussed single-engine operations and did not discuss multi-engine operations.

No flight time was noted until April 2005, when the pilot purchased the MU-2 involved in the accident. At the time of the accident, the pilot had accumulated 11.3 hours in this aircraft.

At the completion of the NTSB review of the logbooks, the totals for the pilot's flight time was approximately 2,170 hours in all aircraft, with 1,931 hours as PIC. Total time in the MU-2 was approximately 551 hours, with 520 hours as pilot-in-command.

AIRCRAFT INFORMATION

The accident aircraft was manufactured in 1973, by Mitsubishi as model MU-2B-25, serial number 266. The aircraft was equipped with two Airesearch TPE-331-6-251M turboprop engines flat rated to 665 shaft horsepower, each driving a Hartzell three bladed, constant speed, full feathering, reversible pitch propeller.

The maintenance logbooks for the airframe, engine and propellers indicated that the right engine s/n: P-20158 was the original engine installed on this aircraft in 1973. The left engine s/n: P-20306 had been removed from an unknown aircraft and installed in N312MA on June 24, 1985, at an engine total time of 2921.99. Three entries dated in April and August 1983, begin the logbook and indicated 100 hour inspections had been completed. No further history prior to 1983 for this engine has been recovered.

In July 2003, the left engine logbook entries indicated that MW Aircraft Services, Inc., and Brit Int'l Aviation Inc., located in Conroe, Texas, removed the engine to investigate a bad Spectrometric Oil Analysis Program (SOAP) test. At this time the airframe total time was reported as 3,897.2 hours, with a hobbs time of 2,235.4 hours. The left engine s/n: P-20306 indicated a total time of 4,349.2 hours, and total cycles of 2,463. The right engine s/n: P-20158 indicated a total time since overhaul of 3,896.4 hours, and total cycles of 5170.

During the inspection, maintenance personnel gained entry to the left engine gearbox to determine the cause of high carbon steel noted in the SOAP test. The entry indicated that both propeller governor drive bearings were rough, the forward bull gear bearing retainer was scored and the high-speed pinion gear teeth were damaged. The gearbox was closed after the needed repairs were made and parts were replaced. The paperwork indicated that all applicable service bulletins and airworthiness directives were complied with and all work was accomplished in accordance with the manufacturer's recommended program and current maintenance manuals.

The pilot purchased the aircraft on April 11, 2005. Before the pilot took custody of the aircraft on April 26, 2005, the aircraft underwent a ten year/500 hour inspection which was accomplished on April 23, 2005, by Intercontinental Jet Corporation, Tulsa, Oklahoma, a Federal Aviation Administration Repair Station. At the completion of the inspection, which was accomplished in accordance with the Mitsubishi MU-2 Maintenance Requirements Manual, the recorded total airframe time was reported as 3,957.4 hours and a recorded hobbs time of 2,295.6 hours. The left engine s/n: P-20306, indicated a total time of 4,409.4 hours time since overhaul with 2,526 cycles. The right engine s/n: P-20158, indicated a total time of 3,956.6 hours time since overhaul and 5,233 cycles. The paperwork indicated that applicable Airworthiness Directives and Service Bulletins were accomplished. The aircraft weight and balance was updated.

A notebook was located in the wreckage which indicated a recording of hobbs time and engine cycles. The previous owner reported to the NTSB IIC that this log was kept by his pilots to

record engine cycles. The log began on May 4, 1997, at a beginning hobbs time of 1,716.8 hours. The previous owner stated that the ending entry dated April 8, 2005, was entered by himself when he flew the aircraft to Tulsa for the pre-purchase maintenance inspection. The recorded hobbs indicated 2,295.6 hours.

The next entries in the log entitled "First Flight Max" was entered on April 26, 2005. The pilot and a representative of Intercontinental Jet accomplished a flight after the completion of the maintenance for a duration of 1.1 hours. On April 27, 2005, the pilot and a representative from Intercontinental Jet accomplished a 6.1 hour flight from Tulsa to McMinnville, Oregon. The ending hobbs time was 2,303.0 hours. Eight flights were logged from April 30 to May 18 for flights to Salem, Oregon; Hillsboro, Oregon, and Eugene, Oregon. The aircraft was based in McMinnville. The last logged entry on May 18, indicated a hobbs time of 2307.1 hours.

A fueling facility at McMinnville indicated that the last fueling of the aircraft at their facility was accomplished on May 21, 2005. At this time, the aircraft was fueled with 149 gallons of jet A fuel with a mixture of Prist.

METEOROLOGICAL INFORMATION

At 1753, the Hillsboro METAR observation indicated a wind from 20 degrees at nine knots. Visibility was 10 statute miles and clear. The temperature was 21 degrees C, and the dew point was 07 degrees C. The altimeter setting was 30.23" Hg.

COMMUNICATIONS

At 1732, the pilot contacted Hillsboro Tower to report that he was inbound for landing. The pilot was instructed to report a three mile left base. The pilot responded, "roger two mile left base." At 1734, the pilot was instructed to square his turn to final and slow to approach speed as he was following a Cessna on a one mile final. The pilot's response was blocked, and the controller again informed the pilot that he was number three following a Cessna and to square his turn and slow to approach speed. The pilot responded "kay."

At 1735, the pilot was cleared to land as the Cessna in front of him was going around. The flight was on the ground by 1735, and the pilot contacted ground control at 1736 to report taxi to Hillsboro Aviation.

At 1750, the pilot contacted ground control for taxi to runway 30. The pilot was instructed to taxi to runway 30.

At approximately 1751, the pilot was cleared for takeoff. The controller then asked the pilot his departure direction, and the pilot responded, southbound. The controller then informed the pilot that departure south was approved. No further communications, other than "thank you" was heard from the pilot.

WRECKAGE AND IMPACT INFORMATION

The wreckage was located on flat terrain in a wet marshy area adjacent to the departure end of runway 30. The accident site coordinates were obtained via a hand held global positioning system (GPS) unit. The coordinates were north 45 degrees 32.921 minutes latitude, west 122 degrees 57.822 minutes longitude at an elevation of 170 feet. The aircraft was laying flat on its belly with the structure crushed downward. The nose of the aircraft was oriented to 210 degrees. All flight control surfaces were accounted for with the furthest piece of the wreckage being the right wing fuel tip tank at 82 feet on a heading of 225 degrees from the main wreckage. The wreckage was confined to one area.

During the extrication of the occupants, rescue personnel removed the top of the cockpit area and displaced the right wing slightly. A section of the right side fuselage was also removed for extrication purposes.
Craters in the soil were noted at the wing tips in the shape of the wing tip tanks. The empennage was twisted to the left about three feet from the center along the longitudinal axis. The vertical stabilizer with the rudder attached was displaced to the left side and nearly flat to the terrain. The horizontal stabilizer and elevators were flattened to the terrain. Both wings were in place and flattened to ground level. Both engines were positioned nose down and buried in the soft moist soil on about a 30 degrees nose down attitude. Both propeller assemblies remained attached to the engines.

The left wing partially separated from the wing center section inboard of the engine nacelle. The upper surface of the wing exhibited compression wrinkles. The outboard flap remained attached to the outboard wing section. The tip tank remained attached to the wing. Impact damage was noted to the nose section of the tank and hydraulic damage was noted to the forward section.

The right wing separated from the wing center section inboard of the engine nacelle. The upper surface of the wing exhibited compression wrinkles. The outboard flap section remained attached to the outboard wing section. The separated right wing fuel tank exhibited impact and hydraulic damage.

Control continuity was established to all flight control surfaces. The main and outboard flap actuators were measured and it was determined that at the time of impact, the flaps were extended 5 degrees. The landing gear was retracted. Trim tab actuator measurements indicated that the elevator was trimmed 5 degrees nose up. The elevator trim indicator in the cockpit verified this setting. The rudder trim actuator indicated 10 degrees nose right and the rudder trim actuator in the cockpit verified this setting. The aileron actuator measurement indicated that the rig pin aligned to 0 degrees.

The right side propeller blades remained attached to the hub. Blade "A" exhibited a slight forward bend with blade material torn away. The tip was curled forward with material missing. Chord wise scratches were noted along the cambered surface. Blade "B" exhibited "S" bending

deformation with leading edge gouging the entire length and chord wise scratches along the cambered surface. Blade "C" exhibited slight "S" bending deformation with the tip curled forward about 90 degrees. Leading edge gouges were noted the entire length with chord wise scratches along the chambered surface.

The left side propeller blades remained attached to the hub. Blade "A" exhibited slight aft bending with the tip of the blade torn away. Minor chord wise scratching were noted along the chambered surface and leading edge gouging was noted. Blade "B" exhibited aft bending near the root area about 90 to 100 degrees with gouging of the material near the tip. Blade "C" exhibited slight forward bending about 20 degrees at the outboard of the blade. Minor gouging was noted along the leading edge.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was accomplished on the pilot by the Office of the State Medical Examiner's Office, Clackamas, Oregon, Larry V. Lewman, M.D. The report indicated that the pilot's cause of death was listed as, "Head and Chest Injuries." During the examination, the coroner indicated that the pilot's body weight was 309 pounds.

Toxicological samples were taken and sent to the Federal Aviation Administration Civil Aero Medical Institute, Oklahoma City, Oklahoma, for analysis. The results of the analysis were positive for Amlodipine which was detected in the liver and kidney.

ADDITIONAL INFORMATION

The engines were removed from the engine nacelles and prepared for transport to the Honeywell facility in Phoenix, Arizona. The investigative team met on July 13-15, 2005, for the teardown inspection at the Honeywell Investigation Laboratory.

Teardown and inspection of the right engine P-20158, noted that the type and degree of damage to the engine was indicative of engine rotation and operation at the time of impact. No pre-existing condition was found that would have interfered with normal operation.

The teardown and inspection of the left engine P-20306, noted that the gearbox section experienced a high cycle fatigue failure of the high speed pinion journal bearing oil supply tube and subsequent degradation of the high speed pinion journal bearings. The teardown examination of the power section of the engine disclosed that the type and degree of damage was indicative of rotation and operation at the time of impact.

See attached Honeywell Teardown Report dated March 17, 2006, for additional details.

The Mitsubishi Airplane Flight Manual for the MU-2B-25 indicated that before takeoff, flaps are to be set to 5 degrees or 20 degrees. A warning indicated: "If flaps 20 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 flaps are at 5 degrees or less." Additional CAUTIONS are listed when making a rolling takeoff. After the aircraft has accelerated to computed rotation speed (Vr) for 5 degrees or 20 degrees flaps and liftoff, pitch attitude of maximum 13 degrees is indicated. After takeoff, maintain pitch attitude 13 degrees nose up maximum. When positive rate of climb is established, the landing gear is retracted. 130 knots calibrated airspeed (KCAS) is to be maintained for the climb out.

If an engine failure occurs in the takeoff climb and the landing gear is fully retracted, the emergency procedures indicated to maintain 140 kcas, flaps to 5 degrees, the failed engine condition lever to EMERGENCY STOP, and failed engine power lever to TAKEOFF. During the on site documentation of the cockpit, the left side condition lever was found in the takeoff/land position and the power lever was found half-way between takeoff and flight idle. Additional CAUTIONS and WARNINGS are indicated in the emergency procedures for the continued flight operations and shutdown procedures.

Normal takeoff calculations for the aircraft with the flaps configured to 5 degrees, indicated a ground run of 2,900 feet and 3,620 feet to clear a 50-foot obstacle. Rotation speed is 106 kcas, and 125 kcas for the climb out. For flaps configured to 20 degrees, calculations indicated a ground run of 2,600 feet and 3,000 feet to clear a 50-foot obstacle. Rotation speed is 100 kcas, and 113 kcas for the climb out.

A performance study was conducted by Mitsubishi at the request of the NTSB IIC to determine if the aircraft was capable of lifting off and climbing out as described by the witnesses. The NTSB provided Mitsubishi with:

- The aircraft accomplished a rolling takeoff and was airborne by the runway intersection (1,300 feet from the approach end of runway 30)
- Aircraft ascended to an approximate altitude of 1,000 feet by the departure end of the 6,600 foot runway
- Field elevation 204 feet
- Temperature 21 degrees C
- Wind from 20 degrees at 9 knots
- Takeoff weight 9,021 pounds

Mitsubishi utilized published takeoff performance data and calculated that the aircraft was capable of rotating at 84 kcas and lifting off within 1,300 feet. Mitsubishi indicated that power-off stall speed for 5 degrees of flaps is 86 kcas and 20 degrees of flaps is 81 kcas. The published Vmc (minimum controllable airspeed) is 100 kcas. Mitsubishi further calculated that the aircraft could accelerate and climb out at 95 kcas, and found that the aircraft could obtain an altitude of 1,000 feet by the end of the runway. The estimated rate of climb was approximately 1,900 feet per minute.

The airframe and all associated components were returned to and released to HLM Air Services, Independence, OR, by May 8, 2006.

Pilot Information

Certificate:	Commercial	**Age:**	60,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2	**Last FAA Medical Exam:**	August 1, 2004
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 1, 2004
Flight Time:	2170 hours (Total, all aircraft), 551 hours (Total, this make and model), 1931 hours (Pilot In Command, all aircraft), 11 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mitsubishi	**Registration:**	N312MA
Model/Series:	MU-2B-25	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	266
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	April 1, 2005	**Certified Max Gross Wt.:**	11625 lbs
Time Since Last Inspection:	12 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	3970 Hrs at time of accident	**Engine Manufacturer:**	Garrett-AiResearch
ELT:	Installed, not activated	**Engine Model/Series:**	TPE-331-6
Registered Owner:	Mychal M. McCartney	**Rated Power:**	715 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:	Max Aviation Inc.	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HIO,204 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	30°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	20°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.22 inches Hg	**Temperature/Dew Point:**	21°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hillsboro, OR (HIO)	**Type of Flight Plan Filed:**	None
Destination:	Salem, OR (SLE)	**Type of Clearance:**	VFR
Departure Time:		**Type of Airspace:**	

Airport Information

Airport:	Portland-Hillsboro HIO	**Runway Surface Type:**	Asphalt
Airport Elevation:	204 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	30	**IFR Approach:**	None
Runway Length/Width:	6600 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	45.533332,-122.949996

Administrative Information

Investigator In Charge (IIC):	Eckrote, Debra
Additional Participating Persons:	Minard Thompson; FAA-FSDO; Hillsboro, OR David E Studtmann; Honeywell; Phoenix, AZ Marlin J Kruse; Honeywell; Phoenix, AZ James E Stermer; Mitsubishi; Addison, TX Norm Beauregard; Mitsubishi; Addison, TX Earl Berry; Mitsubishi; San Angelo, TX
Original Publish Date:	October 3, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=61592