Aviation Investigation Final Report

Location:	Hollister, California	**Accident Number:**	WPR11FA059
Date & Time:	November 25, 2010, 06:28 Local	**Registration:**	VH-PPA
Aircraft:	Mooney M20R	**Aircraft Damage:**	Substantial
Defining Event:	Inflight upset	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Ferry		

Analysis

The pilot departed from the airport for an 11-hour transpacific ferry flight. Recovered GPS data revealed that, during the initial departure, the airplane was climbing on the departure runway heading at a rate of about 500 feet per minute and an airspeed that was high enough to provide for an adequate margin above the stall speed.

About 84 seconds after takeoff, the pilot initiated a left turn toward the first waypoint. During the next 47 seconds, the left turn was completed, and the airplane continued to climb to its maximum altitude of about 1,500 feet above ground level (agl). The airplane began to descend, and about 24 seconds later, it reached a groundspeed of 144 mph and entered a second left turn. Over the remaining 79 seconds of GPS data, the left turn continued with an accompanying series of three diverging groundspeed and altitude oscillations, ending at a groundspeed of 69 mph and an altitude of about 300 feet agl. Witnesses observed the oscillations, which were followed by a spin to the ground.

Ground scars and damage to the airplane were consistent with terrain collision while the airplane was experiencing a flat spin. Postaccident examination revealed no evidence of any airframe or engine failures or malfunctions that would have precluded normal operation. The throttle control was found in the idle position, and the lack of witness marks on the propeller indicated that the engine was operating at low power at the time of impact. These findings are consistent with the spin recovery procedure listed in the Pilot's Operating Handbook that requires the engine throttle be set to the idle position.

The airplane was equipped with a ferry fuel system consisting of a 238-gallon collapsible bladder tank located in the cabin behind the pilot's seat, above the rear seat pans. At the time of the accident, the bladder tank contained about 121 gallons of additional fuel, which supplemented the 89 gallons carried in the two wing tanks. The ferry system design required that the bladder tank be attached to the fuselage utilizing ratcheting straps. The pilot installed the system 2 days before the accident, and a mechanic inspected the installation. The mechanic reported that he observed yellow tie down straps installed over the bladder tank; however, no straps were found at the accident site, and the tank appeared to be unrestrained.

The ferry system operating instructions required that the fuel selector valve be set to the right tank during takeoff. During the postaccident examination, the valve was found in the left tank position. However, fuel was noted in the engine driven fuel pump, flow divider, and fuel lines forward of the firewall, indicating that the incorrect position of the valve did not result in an interruption to the engine’s fuel supply.

In addition to the extra weight of the fuel in the bladder tank, 187 pounds of unsecured baggage was located behind the tank in the aft baggage area, which had a weight limit of 120 pounds. Although the ferry system design allowed for a one-time, 15 percent increase in Maximum Takeoff Weight (MTOW), the weight of the airplane at the time of the accident was estimated to be about 23 percent beyond the standard MTOW. Additionally, an estimate of the airplane’s center of gravity position at the time of the accident revealed that it was about 0.8 inches beyond the aft center-of-gravity limit. No weight and balance sheet referring to the airplane in the ferry flight configuration was located.

It is likely that the aft loading resulted in the airplane encountering longitudinal instability during the initial left turn and entering a series of altitude and pitch oscillations, which would have been extremely difficult for the pilot to control. Also, the unsecured fuel tank and baggage could have moved during takeoff or after the oscillations began, shifting the center-of-gravity farther aft and exacerbating the longitudinal instability.

The previous owner of the airplane reported that he had experienced autopilot anomalies, with symptoms similar to those observed during the airplane's divergence from controlled flight. However, the autopilot had been repaired about 8 months before the accident, and postaccident examination of the autopilot components revealed no evidence of any anomalies that would have precluded normal operation. Additionally, it is unlikely, given the overweight condition of the airplane, that the pilot would have been utilizing it during takeoff.

The stabilizer pitch trim control system was found near the full nose-up position, a position that, given the airplane's aft center-of-gravity, would have made pitch control more difficult to maintain. This position could indicate that the pilot may have been utilizing pitch trim in an effort to assist with regaining flight control after the oscillations began.

The autopilot trim failure warning light was illuminated at the time of ground impact, indicating that one of the following conditions existed: the electric trim master switch was not on, the autopilot system had not been preflight tested, an autotrim failure had occurred, or an electric trim fault was detected. If the electric trim master switch was not on, the manual trim system would still have been functional. If the autopilot system had not been preflight tested, the electric and manual trim systems would still have been functional. An autotrim failure would only be significant if the autopilot was engaged, and, as previously discussed, it is unlikely that the pilot was utilizing the autopilot. If the illumination was due to an electric trim fault, the pilot could have opposed any uncommanded movement of the trim with elevator or manual trim input. Additionally, it is unlikely that a runaway trim condition existed, because the trim was not found at either of its end stops. Although the specific condition that resulted in illumination of the warning light could not be determined, none of the possible conditions would have precluded the pilot from maintaining pitch control.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot did not ensure the airplane was loaded within its weight and balance envelope, which resulted in longitudinal instability and a loss of aircraft control during the initial climb.

Findings

Aircraft	CG/weight distribution - Capability exceeded
Personnel issues	Weight/balance calculations - Pilot
Aircraft	Maximum weight - Capability exceeded
Personnel issues	Aircraft control - Pilot
Aircraft	(general) - Incorrect service/maintenance

Factual Information

History of Flight

Prior to flight	Aircraft loading event
Initial climb	Inflight upset (Defining event)
Initial climb	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On November 25, 2010, at 0628 Pacific standard time, a Mooney M20R, Australian registration VH-PPA, collided with terrain in a plowed field shortly after takeoff from Hollister Municipal Airport (CVH), Hollister, California. Australian Air Ferry Pty Ltd operated the airplane under the provisions of Title 14 Code of Federal Regulations Part 91, as a trans-Pacific ferry flight. The certified airline transport pilot sustained fatal injuries, and the airplane sustained substantial damage. The flight departed Hollister about 0624, with a planned destination of Honolulu International Airport (HNL), Honolulu, Hawaii. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed.

A witness, who was driving north on a highway about 3 miles west of the airport, observed an airplane departing to the west, over the highway, and toward hills. The witness could not judge the altitude of the airplane, but estimated that its position was appropriate relative to the airport. She then lost site of the airplane. A short time later, she observed a similar airplane flying back towards the airport heading eastbound, and noted that its lights were flickering. The nose of the airplane then dropped, and the airplane then leveled off. The nose dropped again, but this time the airplane spun to the ground. A second witness recounted a similar observation, and stated that at no time during the flight did the airplane appear to be trailing smoke or vapors.

The flight was due to be the 11-hour-long first leg of an export ferry flight to Australia, and was to be flown in tandem with a similarly equipped Mooney M20 series airplane.

The pilot of the other airplane reported that he was the first to depart, and that during the climb-out he heard the accident pilot report on the UNICOM (the common traffic advisory frequency) that he was beginning his takeoff roll. He continued his flight to the west, opening his flight plan with Northern California Approach, but became concerned when he did not hear any more communications from the other pilot. He subsequently returned in an effort to locate the other airplane, and a short time later, he observed it in a field west of the airport.

The accident airplane was equipped with a Garmin GPSMap 496 global positioning systems receiver. Historical flight data from the unit was extracted and revealed the entire accident

flight sequence. The data indicated that the airplane entered runway 31 at 0624:20, and immediately commenced with the takeoff roll. The airplane began to accelerate while on a heading of 322 degrees true for the next 36 seconds while remaining at field elevation (230 feet msl). For the next 84 seconds the airplane continued to accelerate to a ground speed of about 138 miles per hour (mph), climbing to 915 feet mean sea level (msl), while still on runway heading. The airplane then began a left turn to 257 degrees, reaching its maximum altitude of 1,502 feet msl, 47 seconds into the turn. For the next 24 seconds the airplane's groundspeed increased to 141 mph with a corresponding 222 feet decrease in altitude. Over the next 89 seconds, the airplane began a left turn with an accompanying series of three diverging groundspeed and altitude oscillations varying between 67 and 144 mph, and 1,383 and 502 feet msl, respectively. The last recorded position occurred at an altitude of 467 feet (300 feet agl) with the airplane on a heading of 344 degrees.

PERSONNEL INFORMATION

A review of Federal Aviation Administration (FAA) airman records revealed that the 28-year-old-pilot held an airline transport pilot certificate with ratings for airplane multiengine land. He additionally held a commercial certificate for airplane single engine land, single engine sea and glider, as well as a flight instructor certificate for airplane single and multiengine land, and instrument airplane.

The pilot held a first-class medical certificate issued in August 2007, with no limitations or waivers.

The pilot was an Australian citizen, and his flight experience information was provided by the Australian Transport Safety Bureau (ATSB). Review of his logbooks by the ATSB revealed that the last entry was recorded on April 24, 2010. At that time, he had accrued a total of 2,540.3 flight hours. The records revealed that the pilot had flown seven multi-legged international ferry flights, three of which were on the same initial route as the accident flight. No prior Mooney aircraft experience was noted in the logbooks.

The pilot had been a member of the International Aerobatic Club since March 2007, and had flown in multiple aerobatic competitions.

AIRCRAFT INFORMATION

The airplane was manufactured in 1999 and equipped with its original Teledyne Continental Motors IO-550-G6B engine, serial number 679377, and McCauley three-blade constant-speed propeller.

FAA records indicated that the airplane was originally registered as N75FM, and then subsequently re-registered as N831RG in January 2006. On October 6, 2010, the airplane was deregistered from the United States Civil Airplane Registry, and shortly thereafter, it was assigned the Australian registration number of VH-PPA.

Review of the airplane's maintenance logbooks revealed that the last annual inspection was completed on April 6, 2010, at a total airframe time of 576.8 flight hours. The Hobbs hour-meter indicated 612.3 hours at the accident site.

Ferry Tank System

The airplane was equipped with a ferry fuel system based on the Auto Avia Design engineering instruction sheet 205/261/EL1. The systems design called for the installation of a collapsible bladder tank behind the pilot's seat, above the rear seat pan scoops. The bladder tank stored an additional 115 gallons of fuel, supplementing the wing tanks, which had a combined fuel capacity of 89 useable gallons. The design required that the bladder tank rest on a section of 1/2-inch-thick plywood positioned over the seat scoops. The tank was to be restrained utilizing 5,000-pound-rated ratcheting straps attached in at least four places to both the rear seatbelt attach points, and the pilot and copilot seat rails. Ferry fuel was to be fed at the discretion of the pilot to the left-hand wing tank drain port via transfer pumps. The ferry fuel system was intended as a wing tank top-up system only, and did not require modifications to the airplane's fuel routing.

METEOROLOGICAL INFORMATION

An aviation routine weather report (METAR) was issued at Salinas Municipal Airport (SNS), Salinas, California (elevation 85 feet msl, 17 miles southwest of accident site), 25 minutes after the accident. It indicated wind from 110 degrees at 6 knots; 10 miles visibility with clear skies; temperature 1 degrees C; dew point minus 3 degrees C; altimeter setting at 30.24 inches of mercury.

COMMUNICATIONS

The pilot filed an International Civil Aviation Organization (ICAO) flight plan with Prescott Flight Service Station prior to departure. The flight plan indicated an initial route from Hollister direct to CINNY intersection.

CINNY intersection is located 190 miles, and about 257 degrees radially from Hollister.

The FAA reported no record of the pilot making contact with any facility after filing the flight plan, or during the flight.

WRECKAGE AND IMPACT INFORMATION

An FAA inspector responded to the accident site. The wreckage was subsequently recovered, and examined by the NTSB investigator-in-charge (IIC), and representatives from the FAA, and Teledyne Continental Motors.

The airplane came to rest in a plowed field 4 miles northwest of the departure end of runway 31. The fuselage remained largely intact, on a north heading, with the wings and tail section still attached. The fuselage structure and tail section sustained vertical crush damage, flaying open, and exposing the inner cabin. The wings and tail cone sustained damage in a similar direction with crush damage noted on all lower surfaces. The engine remained partially attached to the firewall, which had sustained vertical accordion crush damage. The partial contents of the cabin, including fragments of the ferry bladder tank, were ejected to the right side of the fuselage, remaining within the span of the right wing. All sections of the airplane were located in the immediate vicinity of the accident site, and no ground scars were noted beyond the airplanes immediate location.

Within the cabin, the pilot's seat-back had become bent aft, resulting in it folding flat along its entire length. The throttle control was noted in the full aft position, with both the mixture and propeller control full forward. The fuel selector valve appeared set to the left tank position, and was within its detents. The magneto switch key had become broken within the switch mechanism, which remained set to the 'both' position.

MEDICAL AND PATHOLOGICAL INFORMATION

At the request of the pilot's family, an external postmortem examination was performed in-lieu of a complete autopsy. The examination was performed under the auspices of the San Benito Sheriff's Department, with the cause of death reported as the effect of "multiple blunt force injuries."

Toxicological tests on blood, urine, and vitreous specimens from the pilot were performed by the FAA Civil Aeromedical Medical Institute. Analysis revealed no findings for carbon monoxide, or cyanide. The results were negative for all screened drug substances and ingested alcohol. Refer to the toxicology report included in the public docket for specific test parameters and results.

TESTS AND RESEARCH

Airframe

The left and right wings remained attached to their respective wing root, with both ailerons remaining attached at their hinge points. The aileron push-pull tube controls sustained varying degrees of crush damage, and impingement against the lower fuselage structure, and appeared continuous from the ailerons through to the forward cabin.

Both flaps remained attached at their hinge points and appeared to droop to the down position. Both flaps could be freely manipulated up and down by hand, and appeared to be separated from the flap torque tube. The flap jackscrew was examined, and found to be retracted 1.25 inches, (8 threads) within the actuator housing. The remaining threaded portion of the actuator link had separated at the housing lip, with granular surface features noted on

the fracture surface. According to the Mooney representative, the retracted dimension was consistent with a fully retracted flap position.

The landing gear appeared in the fully retracted position, and the speed brakes were stowed.

The moving tail section remained attached to the bulkhead, with the elevators attached at their respective hinge points. The elevator and rudder push-pull tubes were continuous from their respective horns through to the forward cabin where they had become impinged and fragmented against the fuselage belly. All separated control tubes exhibited upward bending damage consistent with fuselage contact during impact.

All circuit breakers related to the trim system were in the closed position. The electrical elevator master trim switch, located on the left panel, appeared in the on position. However, the switch had become folded within the crushed panel, and as such, its position at the time of impact could not be determined. The attitude indicator heading bug was set to 240 degrees.

The stabilizer trim aft jackscrew was examined, and about 14 exposed threads were noted. According to Mooney documentation, this is consistent with a nose-up trim setting, with 16 exposed threads corresponding to full nose-up, and 7 exposed threads for takeoff.

The trim position was further corroborated by examination of the stabilizer trim control system assembly, located in cabin floor area. The dimension of the trim stop from the forward jam nuts was measured. The dimension was 0.9 inches, which according to Mooney documentation, was consistent with a nose-up trim setting, with 0.7 inches correlating to full nose-up. Rotation of the assemblies' output shaft resulted in smooth rotation of the drive sprocket. The trim assembly chain appeared intact, and no damage was noted to the sprockets. The plastic trim wheel had become fragmented, with the center hub still in place. Rotation of the trim wheel hub resulted in rotation of output drive shaft at the trim assembly.

The remaining sections of the elevator trim system were examined and exhibited varying degrees of crush and fragmentation damage. No anomalies were noted to the trim system.

Engine

The engine sustained vertical crush damage to the lower oil sump and exhaust stacks, which were crushed. The sump was perforated by the pickup tube, and oil was noted throughout entire lower engine area.

The propeller had become separated from the engine at the crankshaft flange. All three blades remained attached to the hub. One blade sustained 30 degrees aft bending at the root.

The fuel system lines had sustained varying degrees of crush damage and fragmentation. No indications of fuel leaks or staining were noted. The fuel line connecting the fuel injector throttle body to the flow divider was removed, and approximately 2 teaspoons of fuel drained

from the line.

The fuel mixture and throttle control cables were continuous from the cockpit controls through to their respective linkage arms. The mixture was in the full rich position at both the cabin control and the fuel pump, where the arm had become bent forward. The throttle control was found in the full-aft position within the cabin, and the throttle valve was observed in the closed position when viewed through the throttle body. The propeller control cable was continuous from the cockpit control through to the forward section of the engine, where it had become separated at the control linkage arm eye-bolt. The fuel pump was disassembled, and fluid consistent in color and odor with aviation gasoline was present within the pump cavities. The fuel flow divider and lines were free of damage and subsequently removed from the engine. The flow divider was disassembled, and fuel was present within the cavity. The inlet screen was free of debris. The fuel was tested for the presence of water utilizing SAR-GEL water detecting paste, and no water was detected. The valve plunger and diaphragm retaining nut were tight and secure, and the fuel lines were free of obstruction.

Both magnetos remained firmly affixed to their pads and were free of damage. The spark plugs were removed from the engine and examined. The spark plug electrodes displayed normal wear signatures when compared to the Champion AV-27 check-a-plug chart. The spark plug electrode areas displayed gray deposits, with the upper and lower plugs from cylinders 1, 3, and 5 exhibiting a light residue of oil. Rotation of the crankshaft by hand via the propeller flange resulted in sparks at each ignition lead end.

The cylinders were examined utilizing a borescope. The piston heads and combustion chambers exhibited gray combustion deposits. The valve heads were undamaged and no signs of abnormal thermal discoloration were noted. Removal of the rocker covers revealed all valve springs and rockers to be wet with oil and intact. Rotation of the crankshaft by hand utilizing the forward accessory drive gear resulted in compression at each cylinder, mechanical continuity of the drive train through to the accessory case, and equal amounts of lift at each valve. The camshaft forward and aft gears were undamaged and appeared lubricated.

No anomalies were noted, which would have precluded normal engine operation. Refer to the public docket for the complete airframe and engine report.

Ferry Tank System

Examination of the airplane wreckage revealed that no bladder tank support straps were installed. The bladder was additionally equipped with orange tie-down straps, stitched into the bladder material, but these were also not attached to the fuselage structure. The aft seat belts were still in place, and had not been removed to make room for the tank straps. Examination of the bladder tank fragments revealed that it was a 238-gallon-capacity air cargo type, manufactured by Turtle-Pac.

Two 7-foot-long sections of 1/2-inch thick plywood had been installed across the full width of

the fuselage spanning from the back of the front seat through to the baggage compartment. The plywood obscured access to the aft seat belt anchor points. Additional plywood strips and foam padding were located along the inner fuselage sidewalls.

The airplane was equipped with baggage tie-down straps. The lower straps were located underneath the plywood, and as such, were obscured from a position where they could be utilized to secure the baggage.

The pilot installed the fuel ferry system, 2 days prior to the accident. Review of the airplane's maintenance records revealed that on November 23, 2010, a certified Airframe and Powerplant mechanic found the airplane's ferry fuel system fit for flight. In a subsequent interview with the IIC, the mechanic stated that he observed yellow tie down straps installed over the bladder tank at the time of the inspection. The pilot of the other Mooney stated that prior to departure, the tank in the accident airplane was positioned behind the pilot seat, and held in place by the airplane's sidewalls and luggage in the aft baggage area.

Fueling records obtained from Gavilan Aviation, Inc., revealed that the airplane was serviced with the addition of 210 gallons of aviation gasoline at 1730 the night prior to the accident. The pilot of the other airplane reported that the wing fuel tanks were emptied during the installation of the ferry fuel system, and as such, the fuel purchased reflected the total fuel onboard.

Operating Limitations

The Operating Instructions for the ferry tank system referred to Mooney engineering instructions, which allow for a one-time 15 percent increase in maximum takeoff weight (MTOW) totaling 3,873 pounds. Under this condition, the center of gravity range must be between 47.5 and 51.0 inches. Additionally, the never exceed speed (Vne) varies linearly between 174 knots at the airplane's standard MTOW of 3,368 pounds through to 124 KIAS at 3,873 pounds.

Weight and Balance

A weight and balance report, dated November 2004, was located in the airplane. The report indicated a basic empty weight of 2,400.4 pounds. No weight and balance sheet referring to the airplane in the ferry flight configuration was located.

The following approximate loading information was garnered during the on-scene, and follow-up examinations. The weight within the forward cabin area, which included the pilot, baggage, water, and the fuel transfer pump system, was about 285 pounds. The aft seat area, which contained the bladder fuel tank, its associated plywood supports, long-range radio, and an assumed total fuel of 121 gallons, was about 722 pounds. The equipment in the aft baggage area totaled about 187 pounds, and included both aft seats, plywood supports, additional water, baggage, and a life raft. According to the Mooney Pilot Operating Handbook (POH), the maximum allowable weight in the baggage area was 120 pounds. The wing fuel tanks, with a

usable capacity of 89 gallons, were estimated to contain about 534 pounds of fuel.

Based on these values, the airplane's weight at takeoff was about 4,128.4 pounds, 255.4 pounds in excess of the MTOW in the ferry tank configuration, and 760 pounds beyond the standard MTOW. Extrapolation of the weights and cargo positions based on the Mooney loading graph, resulted in a center of gravity position of 51.79 inches, 0.79 inches beyond the aft center of gravity limit.

Engine Monitor System

The airplane was equipped with a JPI EDM-700 engine data monitor. The unit was recovered from the airplane, and sent to the NTSB office of Research and Engineering for data extraction. The data revealed that the monitor was configured to capture exhaust gas (EGT) and cylinder head temperatures (CHT) only, at sampling intervals of 490 seconds. The last recorded flight was number 270, and consisted of three data points. It could not be determined If the recorded data was from the accident flight. The EGT and CHT temperature variances across all cylinders for this and the last 10 flights was about 100 degrees and 50 degrees, respectively. The pilot of the other airplane stated that he flew with the accident pilot in VH-PPA to the San Diego area a few days prior to the accident to determine the engine's oil consumption. He reported that the flight was uneventful, and the engine appeared to be operating normally.

Autopilot

The airplane was equipped with a factory-installed two-axis (roll and pitch) Bendix/King (Honeywell) 150 series Automatic Flight Control System (autopilot). The system utilized an electric pitch trim, which provided autotrim during autopilot operation, as well as manual trim for the pilot. The system incorporated a lockout feature, designed to prevent autopilot use until a successful preflight test has been accomplished.

The prior owner of the airplane reported that in December 2009 he was experiencing autopilot anomalies. He stated that if he utilized the heading selector knob to make changes of greater than 30 degrees, the airplane would "violently" pitch up and down at the initiation of the turn. The oscillating pitch variations would diminish as the turn progressed. He estimated that the airplane would deviate in altitude between +/- 200 to 300 feet during the turn, eventually returning to the original altitude. He was able to compensate for the anomaly by inputting heading changes in 10-degree increments during the turn. He did not disclose this problem to a mechanic, or the new owner when he sold the airplane in March 2010.

Maintenance records indicated that in March 2010 the attitude indicator was removed from the airplane for service due to its pitch and roll outputs being out of tolerance. According to the records, the unit was subsequently repaired, recalibrated, and reinstalled in the airplane. According to a representative from Honeywell, the autopilot utilizes the pitch and roll outputs from the attitude indicator to process turn commands, and as such, the pitch oscillations experienced by the prior owner would most likely have been caused by the reported out of

tolerance condition.

The pilot of the second Mooney stated that it was his policy not to utilize the autopilot until the airplane had consumed enough fuel to be back within its normal operating weight range, which was typically 4 to 5 hours after takeoff. He stated that it was also "drilled" into the accident pilot that the autopilot was not to be used until this condition had been met. The ferry fuel system installation and operating instructions did not make reference to autopilot use during ferry flights.

The autopilot system components were removed from the airplane for examination at the Honeywell facilities in Olathe, Kansas. The components had sustained varying degrees of impact damage, and as such, only a partial series of functional tests could be completed. The components were subsequently disassembled, and examined. No anomalies were noted which would have precluded normal operation. A full examination report is contained within the accident docket.

During the examination, the lamp filaments from the indicator panel of the KC-191 Flight Computer were examined. All lamp filaments with the exception of the trim failure warning lamp, were either intact and upright, or broken midspan. The trim failure warning lamp filament remained intact, but exhibited stretching to its filament, and was bent in the downwards direction relative to the airplanes vertical axis.

According to the autopilot operating instructions, the illumination of only the trim failure warning lamp indicated that the unit had either been powered-up, and no system self-test had been performed, or that a test was performed but the system failed. Additionally, the illumination could indicate a trim failure during flight. Under all of these conditions, the autopilot is inoperative.

Subsequent to release of the airplane wreckage to the owner, The FAA issued an Airworthiness Directive 2012-05-09, mandating the inspection of the tail pitch trim assembly per Mooney Service Bulletin (SB) M20-313A. The SB made reference to a trim assembly filler mounting plate, which had been installed in the incorrect position on some airplanes. The service bulletin additionally required inspection of the trim assembly huckbolts for security. Photographs of the trim assembly were reviewed, and revealed that the filler plate and trim hinge assembly had been installed in the correct order. Additionally, the huckbolts were free of indications of movement.

ADDITIONAL INFORMATION

Emergency Procedures

The POH, which was located onboard the airplane, details the following steps in the event of an inadvertent spin:

Throttle: RETARD to IDLE
Aileron: NEUTRAL
Rudder: Apply FULL RUDDER opposite direction of spin
Control Wheel: FORWARD of neutral in a brisk motion

The POH stated that should a stall occur, the airplane must not be allowed to enter a deep stall. Furthermore, up to 2,000 feet of altitude may be lost in a one-turn spin and recovery.

Performance

The POH notes that at MTOW, with flaps retracted, the stall speed is 66 knots indicated airspeed (KIAS).

The Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25A, states the following:

"Longitudinal stability is the quality that makes an aircraft stable about its lateral axis. It involves the pitching motion as the aircraft's nose moves up and down in flight. A longitudinally unstable aircraft has a tendency to dive or climb progressively into a very steep dive or climb, or even a stall. Thus, an aircraft with longitudinal instability becomes difficult and sometimes dangerous to fly."

Static longitudinal stability or instability in an aircraft, is dependent upon three factors:

1. Location of the wing with respect to the CG

2. Location of the horizontal tail surfaces with respect to the CG

3. Area or size of the tail surfaces

....Dynamic stability refers to the aircraft response over time when disturbed from a given AOA, slip, or bank. This type of stability also has three subtypes:

- Positive dynamic stability-over time, the motion of the displaced object decreases in amplitude and, because it is positive, the object displaced returns toward the equilibrium state.

- Neutral dynamic stability-once displaced, the displaced object neither decreases nor increases in amplitude. A worn automobile shock absorber exhibits this tendency.

- Negative dynamic stability-over time, the motion of the displaced object increases and becomes more divergent."

Associates of the pilot reported that he often carried a digital video camera to record his flights. No such camera was located within the wreckage.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor; Foreign; Private	**Age:**	28,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	August 1, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	2540 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	VH-PPA
Model/Series:	M20R	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	29-0182
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 6, 2010 Annual	**Certified Max Gross Wt.:**	3368 lbs
Time Since Last Inspection:	36 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	577 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-550 SERIES
Registered Owner:	Premier Aircraft Sales	**Rated Power:**	300 Horsepower
Operator:	Australian Air Ferry Pty Ltd	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SNS,85 ft msl	**Distance from Accident Site:**	17 Nautical Miles
Observation Time:	06:53 Local	**Direction from Accident Site:**	214°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	110°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.23 inches Hg	**Temperature/Dew Point:**	1°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hollister, CA (CVH)	**Type of Flight Plan Filed:**	IFR
Destination:	Honolulu, HI (HNL)	**Type of Clearance:**	IFR
Departure Time:	06:24 Local	**Type of Airspace:**	

Airport Information

Airport:	Hollister CVH	**Runway Surface Type:**	Asphalt
Airport Elevation:	230 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	31	**IFR Approach:**	None
Runway Length/Width:	6350 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	36.917221,-121.487503

Administrative Information

Investigator In Charge (IIC):	Simpson, Eliott
Additional Participating Persons:	Earl S Lebsack; Federal Aviation Administration FSDO; San Jose, CA Andrew Swick; Teledyne Continental Motors; Mobile, AL Ian Brokenshire; Australian Transport Safety Bureau
Original Publish Date:	May 3, 2012
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=77876