Aviation Investigation Final Report

Location:	Marco Island, Florida	**Accident Number:**	ERA13LA374
Date & Time:	August 24, 2013, 10:30 Local	**Registration:**	N3700H
Aircraft:	Mooney M20J	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that he set the flaps at 15 degrees for takeoff and that the flap position indicator and the adjacent pitch trim position indicator appeared to "line up," which was normal. However, during the takeoff, the airplane pitched up more rapidly than normal, and the pitch trim did not seem to be working. The event occurred too quickly for the pilot to abort the takeoff, and, because of the relatively low airspeed and the high engine torque and P-factor, he was unable to counteract the airplane's left turning tendency. The airplane subsequently descended into a swamp left of the runway.

At the accident scene, the airplane's flap and trim position annunciators indicated that the flaps were in the "takeoff" position but that the pitch trim was in the "up" position; the Pilot's Operating Handbook stated that the pitch trim was to be set to the "takeoff" position for takeoff. For pitch trim control, the airplane's entire empennage would have pivoted to increase or decrease the horizontal stabilizer angle. The system used a worm gear, which would have prevented the annunciated trim position from moving when the airplane impacted the ground. Pitch trim was subsequently tested electrically to the stops with no binding noted. The pilot did not report any runaway pitch anomalies.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's improper pitch trim setting before takeoff, which resulted in the airplane's rapid, nose-high pitch at takeoff and the pilot's subsequent loss of control.

Findings

Aircraft	Stabilizer actuator - Incorrect use/operation
Personnel issues	Incorrect action performance - Pilot
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Prior to flight	Preflight or dispatch event
Takeoff	Loss of control in flight (Defining event)
Takeoff	Runway excursion

On August 24, 2013, about 1030 eastern daylight time, a Mooney M20J, N3700H, was substantially damaged when it impacted swampy terrain during a takeoff attempt from Marco Island Airport (MKY), Marco Island, Florida. The airline transport pilot sustained minor injuries. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, to Wing South Airpark (FA37), Naples, Florida. The personal flight was operating under the provisions of 14 Code of Federal Regulations Part 91.

According to the pilot, he set the flaps at 15 degrees for takeoff, and the flap indicator and trim indicator next to each other appeared to line up, which was normal. However, during the takeoff, at an approximate rotation speed of 63 knots indicated, the airplane pitched up more rapidly than normal and the stabilizer trim did not seem to be working.

The event occurred so suddenly that the pilot did not have an opportunity to abort the takeoff with a power reduction. "It was an uncommanded pitch-up and the yoke would not respond to counteract the pitch and turn The rudder and ailerons were stuck in the neutral position and would not move in the direction to initiate a right counteracting turn. Although the left turning tendencies are well known on takeoff with high power and angle of attack ("P" factor, torque and slipstream affect all work together requiring lots of right rudder), something caused the stab trim to go forward and prevent the normal rudder and aileron coordination for a turn to the right to counteract the left turning tendencies."

The airplane then descended into the swamp to the left of the runway.

According to the pilot's operating handbook (POH), "Push-pull tubes with self-aligning rod end bearings actuate the primary flight control surfaces. A spring-loaded interconnect device indirectly joins the aileron and rudder control systems to assist in lateral stability during flight maneuvers."

In addition, "For pitch control, the entire empennage pivots on the tail cone attachment points to increase or decrease the horizontal stabilizer angle. This design allows flight trim establishment with minimum control surface deflection. A trim indicator on the console indicates stabilizer trim position. In flight, forward rotation of the trim wheel lowers the nose; rearward rotation raises the nose."

A photograph of the trim/flap annunciator taken at the accident site by a Federal Aviation Administration (FAA) inspector showed separate indicators for each, with positions noted as "Down", "Takeoff" and "Up." The flap indication was in the "Takeoff" position, while the trim indication was in

the "Up" position. A corner of the photograph also showed the autopilot controller, which indicated the autopilot as being "Off."

According to a representative of Mooney, and as verified in the M20J Illustrated Parts Catalog, trim position was established via a "trim screw assembly" (worm drive) which would not have been movable as a result of ground impact. The representative also noted that according to a company engineer, earlier models of the airplane "could jam if the trim was electrically or manually run hard up against the stops. The jack screw and jam nuts have since been re-designed to resolve the issue."

After the airplane had been moved to a storage facility, the FAA inspector tested the trim electrically to the stops and noted no binding.

According to the pilot, he was a partial owner of the airplane and the only one to fly it. He did not run the trim to the stops during the preflight checks, and he didn't know why the trim would have been in the "Up" position.

Per the M20J Pilot Operating Handbook, Before Takeoff checklist, "Trim – Takeoff Setting."

Pilot Information

Certificate:	Airline transport	**Age:**	70
Airplane Rating(s):	Single-engine land; Single-engine sea	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	July 16, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 15, 2012
Flight Time:	20238 hours (Total, all aircraft), 2250 hours (Total, this make and model), 19750 hours (Pilot In Command, all aircraft), 113 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N3700H
Model/Series:	M20J	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-1038
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 1, 2013 Annual	**Certified Max Gross Wt.:**	2740 lbs
Time Since Last Inspection:	74 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4631 Hrs	**Engine Manufacturer:**	LYCOMING
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	I0-360-A3B6D
Registered Owner:	On file	**Rated Power:**	200 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MKY,5 ft msl	**Distance from Accident Site:**	
Observation Time:	10:15 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 1900 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.06 inches Hg	**Temperature/Dew Point:**	29°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Marco Island, FL (MKY)	**Type of Flight Plan Filed:**	None
Destination:	NAPLES, FL (FA37)	**Type of Clearance:**	None
Departure Time:	10:30 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Marco Island MKY	**Runway Surface Type:**	Asphalt
Airport Elevation:	5 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	17	**IFR Approach:**	None
Runway Length/Width:	5000 ft / 100 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	25.995,-81.6725(est)

Administrative Information

Investigator In Charge (IIC):	Cox, Paul
Additional Participating Persons:	Greg Morales; FAA/FSDO; Miramar, FL
Original Publish Date:	January 12, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87859