Aviation Investigation Final Report

Location:	Oshkosh, Wisconsin	**Accident Number:**	CEN15FA311
Date & Time:	July 22, 2015, 07:44 Local	**Registration:**	N4BP
Aircraft:	Piper PA-46-310P	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	3 Serious, 2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was landing at a large fly-in/airshow and following the airshow arrival procedures that were in use. While descending on the downwind leg for runway 27, the pilot was cleared by a controller to turn right onto the base leg abeam the runway numbers and to land on the green dot (located about 2,500 ft from the runway's displaced threshold). About the time the pilot turned onto the base leg, he observed an airplane taxi onto the runway and start its takeoff roll. The controller instructed the pilot to continue the approach and land on the orange dot (located about 1,000 ft from the runway's displaced threshold) instead of the green dot. The pilot reported that he considered performing a go-around but decided to continue the approach. As the pilot reduced power, the airplane entered a stall and impacted the runway in a right-wing-low, nose-down attitude. Witnesses estimated that the bank angle before impact was greater than 60 degrees. A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

Analysis of a video recording of the accident showed that the airplane was about 180 ft above ground level (agl) when the turn onto the base leg began, and it descended to about 140 ft agl during the turn. The airplane's total inertial speed (the calculated vector sums of the airplane's ground speeds and vertical speeds) decreased from 98 knots (kts) to 80 kts during the turn. During the last 8 seconds of flight, the speed decreased below 70 kts, and the airplane descended from about 130 ft agl to ground impact. The wings-level stall speed of the airplane at maximum gross weight with landing gear and flaps down was 59 kts. In the same configuration at 60 degrees of bank, the stall speed was 86 kts and would have been higher at a bank angle greater than 60 degrees.

Reduced runway separation standards for airplanes were in effect due to the airshow. When the accident airplane reached the runway threshold, the minimum distance required by the standards between the arriving accident airplane and the departing airplane was 1,500 ft. The video analysis indicated that it was likely that a minimum of 1,500 ft of separation was maintained during the accident sequence.

Although the pilot was familiar with the procedures for flying into the airshow, the departing airplane and the modified landing clearance during a period of typically high workload likely interfered with the pilot's ability to adequately monitor his airspeed and altitude. As a result, the airplane entered an accelerated stall when the pilot turned the airplane at a steep bank angle and a low airspeed in an attempt to make the landing spot, which resulted in the airplane exceeding its critical angle of attack. At such a low altitude, recovery from the stall was not possible. Although the airshow arrival procedures stated that pilots have the option to go around if necessary, and the pilot considered going around, he instead continued the unstable landing approach and lost control of the airplane.

Probable Cause and Findings

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

The pilot's failure to perform a go-around after receiving a modified landing clearance and his failure to maintain adequate airspeed while maneuvering to land, which resulted in the airplane exceeding its critical angle of attack in a steep bank and entering an accelerated stall at a low altitude.

Findings

Aircraft	Airspeed - Not attained/maintained
Aircraft	Lateral/bank control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Lack of action - Pilot
Environmental issues	Traffic pattern procedure - Effect on operation

Factual Information

History of Flight

Approach-VFR pattern base	Aerodynamic stall/spin (Defining event)
Approach-VFR pattern base	Loss of control in flight
Approach-VFR pattern base	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On July 22, 2015, about 0744 central daylight time, a Piper Malibu PA-46-310P single-engine airplane, N4BP, sustained substantial damage when it impacted runway 27 (6,179 ft by 150 ft, concrete) while landing at the Wittman Regional Airport (OSH), Oshkosh, Wisconsin. The pilot and two passengers sustained serious injuries and two passengers sustained minor injuries. The airplane was registered to DLM Holding Group LLC and operated by the pilot under the provisions of the 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed at the time of the accident and no flight plan was filed. The flight departed the Southwest Michigan Regional Airport (BEH), Benton Harbor, Michigan, about 0730 eastern daylight time.

The pilot reported that he departed BEH and overflew Kenosha, Burlington, Hartford, Ripon, and Fisk, Wisconsin. He then proceeded to fly the Fisk arrival procedures for runway 27 which were in use per the notice to airmen (NOTAM) for the EAA AirVenture 2015 air show at OSH. The pilot reported that he entered the right downwind leg for runway 27 at 1,800 ft and started to descend while maintaining 90 kts airspeed. He reported that he was instructed by air traffic control (ATC) to turn onto the base leg abeam the runway numbers and to land on the green dot (located about 2,500 ft from the runway 27 displaced threshold). After he started the base turn, he observed a twin-engine airplane taxi onto runway 27 and start its takeoff roll. (A passenger in the Malibu identified the airplane on the runway as a Cessna "high-wing 4-seater") The pilot was concerned about the airplane on the runway and was worried about a collision. The pilot reported that ATC instructed him to continue the approach and land on the orange dot (located about 1,000 ft from the runway 27 displaced threshold) instead of the green dot. The pilot considered doing a go-around, but decided to continue the approach. He reported that about 250 to 300 ft above ground level, he pulled back on the power which resulted in the airplane entering a stall. He attempted to recover by adding full power, but the airplane impacted the runway in a right wing low, nose down attitude. The right wing hit the runway which resulted in an explosion with fire and black smoke rising above the accident site. The right wing separated from the airplane and landed in the grass on the south side of the runway. The airplane skidded on its belly and came to rest on the left side of the runway about 278 ft from the initial impact point. The left wing was partially separated from the fuselage and there was a fire under the left wing.

The two passengers who were sitting in the middle, rear-facing seats, and the passenger sitting in the rear seat exited the airplane with assistance from the pilot and people who arrived at the site soon after the accident. The Crash Fire Rescue (CFR) personnel arrived at the scene and used foam to put out the

fire. The passenger sitting in the copilot's seat was extracted from the wreckage by the CFR. All five survivors were taken to local hospitals for treatment.

Numerous witnesses reported that they saw the airplane on the base leg as it entered a steep right bank and impact the terrain in a steep nose down, right wing low attitude. One witness reported that he was located on the terminal ramp to the north of the approach end of runway 27. He heard an aircraft approaching from over the terminal building and observed that the airplane was very low – less than 200 ft above ground level (agl). The witness said that there was no indication that the airplane was in distress, such as a sputtering engine. He further reported that the airplane entered a steep right turn, with an estimated angle of bank of over 60 degrees and then impacted on its side with the right wing contacting the ground first.

AIR TRAFFIC CONTROL COMMUNICATIONS

Special procedures and staffing for ATC were in effect during the Experimental Aircraft Association's AirVenture event. The North Local Control (NLC) team was located in the control tower. The team consisted of five controllers: two spotters, one communicator, a team leader, and a front-line manager (FLM) overseeing the operation. At the time of the accident, the NLC team was responsible for issuing landing clearances on runway 27. The Itinerant Mobile (IM) team, who had overall responsibility for ATC departure operations on runway 27, was working from a Mobile Operations Communications Workstation (MOOCOW) located at the intersection of runway 27 and taxiway A. The IM team was responsible for clearing aircraft for takeoff on runway 27 and consisted of four controllers: an aircraft communicator (AC), one spotter/coordinator, and two "crossers" who work directly with aircraft holding for departure on the taxiway. Communication between the IM and NLC teams was conducted via portable FM (frequency modulation) radios used by the MOOCOW AC and the NLC FLM, although coordination was kept to a minimum. The IM team was responsible for ensuring separation between arrivals and departures by monitoring the inbound pattern traffic and releasing departures when there was sufficient time to do so before the next aircraft landed.

Instructions for the Fisk arrival contained in the AirVenture NOTAM direct pilots to minimize radio transmissions and not respond to ATC communications. Review of recorded transmissions from the NLC team and the IM team showed that at 0742:24, the NLC communicator instructed a Malibu on downwind for runway 27 to begin descent. At 0742:44, the Malibu pilot was told to, "…turn abeam the numbers, runway 27 green dot cleared to land."

Before and during the period the Malibu was operating in the traffic pattern, the IM team was clearing departures for takeoff from runway 27. Between 0730 and 0743 there were about 22 departures. The last departure before the accident was "Cessna 44Q", cleared for takeoff at 0743:03. The IM communicator then continued, "44Q roll it around the corner – scoot!"

At 0743:11, the NLC communicator transmitted, "Malibu I've got somebody on the runway – keep it coming around keep it coming around cleared to land runway 27 orange dot, land as soon as you can."

At 0743:23, the IM communicator transmitted, "Don't turn your back – don't turn your back!"

There were no further transmissions on the IM frequency.

The tower controllers notified airport firefighters to respond, extinguish the post-crash fire, and assist the aircraft's occupants.

The IM communicator reported that the Malibu looked "normal" on downwind over the gravel pit, but the next time he saw it, the aircraft looked unusually low for a runway 27 arrival. The Malibu was west of the terminal building and had not yet started to turn right base. The next departure was holding short between 125 and 250 feet from the runway. Traffic was very light, and there were no other aircraft waiting to depart. The communicator cleared the Cessna for takeoff. The communicator then observed that the Malibu was lower and "tighter" on base than he expected, so he went on frequency and told the Cessna pilot to hurry up. The Cessna pilot never stopped, and made a rolling takeoff as requested. The Malibu was over the terminal building and then turning toward the runway. The communicator reported that by then, the departing Cessna was rolling and approaching or beyond the green dot on the runway.

The communicator reported that the Malibu was on downwind west of the terminal building, and had not turned base yet when the Cessna was cleared for takeoff. He stated that controllers try to use minimum spacing during AirVenture, and to expedite traffic to avoid go-arounds. Because arriving aircraft were on the NLC frequency, the IM communicator could not directly instruct a pilot to go around. Should a go-around appear necessary, the IM team would contact the tower FLM via FM radio and the FLM would either override the tower frequency and send the aircraft around or ask the tower communicator to do so. The communicator stated that he had no reluctance to call for a go-around if he perceived an unsafe situation.

The communicator reported that while the Malibu was turning from downwind to base, it looked like it was making a continuous turn to final. Partway down the curving "base" leg, it briefly rolled wings level and was heading straight southbound. The Malibu was "very low" at that point. The communicator reported that the airplane overshot the final approach course and rolled into a very steep bank to try to line up with the runway. The wings looked almost perpendicular to the ground. He made the "don't turn your back" radio transmission, which was directed at one of the spotters, because the Malibu was in an unusual maneuver and the spotter needed to watch out for it.

Runway Separation

Under normal circumstances, controllers would be required to maintain at least 3,000 ft of separation between a departing Cessna and an arriving Malibu using the same runway. According to the reduced runway separation standards authorized during AirVenture, the minimum required distance between the arriving Malibu and the departing Cessna was 1,500 ft when the Malibu reached the runway threshold.

PERSONNEL INFORMATION

The 46-year-old pilot held a private pilot certificate with a single-engine land rating and an airplane instrument rating. He reported that he had 934 total hours of flight time with 130 hours in make and model. He held a third class medical certificate that was issued on December 3, 2014, with no limitations.

The pilot reported that he had flown to OSH during the EAA AirVenture Airshow numerous times and was familiar with the procedures for flying to OSH during the week of the airshow. He reported that on the morning of the accident, the airplane traffic was light and there was no other airplane on downwind when he was landing. He reported that he was surprised that the controllers cleared the "twin-engine" to

taxi onto the runway and depart when he had already turned onto the base leg of the approach. He reported that he initially thought about doing a go-around, but decided to land when he was instructed to land on the orange dot.

AIRCRAFT INFORMATION

The airplane was a single-engine Piper Malibu PA-46-310P, serial number 46-8408065, manufactured in 1984. It had a maximum gross weight of 4,100 lbs and it seated six. It was equipped with a Continental 300-horsepower TSIO 550-C (1) engine, serial number 802599. The last annual maintenance inspection was conducted on November 12, 2014, with a total airframe time of 5,792 hours. The engine had 1,439 hours since the last overhaul.

METEOROLOGICAL INFORMATION

At 0740, the surface weather observation at OSH was: wind 250 degrees at 3 kts; visibility 10 miles; sky clear; temperature 19 degrees C; dew point 14 degrees C; altimeter 29.97 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane's initial impact point was just right of centerline in the threshold area of runway, 55 ft from the start of runway 27. The scraping on the runway and the burn path that was on a 238-degree heading led to the right wing which was190 ft from the initial contact point. Five parallel slash marks were found in the runway's concrete surface, which were consistent with propeller strikes. Three composite propeller blades were found in the debris field. All three blades were separated at the blade root and all exhibited extensive impact damage.

The right wing was separated from the fuselage at the wing root. The wing was intact but it exhibited fire and impact damage, and the outboard span of the wing was bent upward and twisted. The right landing gear was found in the down position. The flap bellcrank was broken at the outboard rod end. The flap actuator was inspected and it indicated that the flaps were in the down position. The aileron remained attached to the wing. Both aileron cables were separated at the wing root.

The fuselage was located 278 ft from the initial impact point on a 242-degree heading. The left wing was still attached to the fuselage, but it was partially separated at the wing root. The flap and aileron remained attached to the left wing. The flap bellcrank was broken at the outboard rod end. Both aileron cables were separated at the wing root. The empennage remained attached to the fuselage and exhibited little impact damage. The elevator, rudder, and trim cables were connected to their control surfaces to the flight controls and control surface movement was confirmed. The hour meter indicated 1,452 hours. The JPI EDM-930 engine monitor was sent to the National Transportation Safety Board's (NTSB) Vehicle Recorder Laboratory for examination.

The engine examination revealed that all the cylinders remained in place and attached to the crankcase. Cylinders Nos. 3 and 5 were impact damaged. The engine was manually rotated and there was thumb compression on all six cylinders, although the compression on Nos. 3 and 5 was weak due to the impact damage. Drive train continuity was confirmed when the engine was rotated and the accessory gears on the rear of the engine turned respectively. The top spark plugs were inspected and exhibited normal wear and color. The left and right magnetos produced spark and the impulse couplings were heard to operate when rotated. The fuel system remained intact. The fuel throttle body and metering unit were intact and

undamaged. The fuel manifold diaphragm was intact and the fuel screen was uncontaminated. Aviation fuel was found in the fuel lines leading from the fuel manifold to the individual fuel injectors. The propeller hub remained attached to the crankshaft propeller flange.

TESTS AND RESEARCH

JPI EDM-930 Engine Monitor

The NTSB Vehicle Recorder Laboratory examined the JPI EDM-930 engine monitor's non-volatile memory (NVM) and it was determined that the accident flight was recorded. The recorded time was correlated to central daylight time.

The recording began around 06:20. Values for exhaust gas temperature and cylinder head temperature began to rise. Around 06:30, manifold pressure and engine RPM rapidly increased consistent with the aircraft beginning a takeoff roll. Most recorded parameters remained stable from approximately 06:35 until approximately 07:25.

At 07:25, manifold pressure was reduced. Fuel flow, oil pressure, oil temperature, EGT and CHT all began slightly negative trends. Near the end of the recording, around 07:43, manifold pressure sharply decreased in value along with engine RPM. In the last recorded values, engine RPM, manifold pressure, fuel flow and values for CHT and EGT began to sharply rise. The recording ended abruptly at 07:44.The engine parameters were generally increasing in value just prior to the recording abruptly ending at 07:44. The NTSB Engine Data Monitor (EDM) report has been entered in the docket.

NTSB Video Study

The NTSB Office of Research and Engineering produced a video study based on a video recording of the accident flight. The Malibu was captured in a video for approximately eighteen seconds before it impacted the ground on runway 27. The video was recorded by a Kodak SP360 camera mounted inside the cockpit of a parked airplane that was not involved in the accident. The camera had a 360-degree panoramic field of view. The location of the parked airplane was on the north ramp near the airport terminal.

The video study estimated that the altitude of the Malibu as it initiated its turn to base leg was about 180 ft agl, and it descended to about 150 to 130 feet agl on the base leg. During the last 8 seconds of flight, the Malibu descended from about 130 ft agl to ground impact. The total inertial speed (the vector sums of the ground speeds and vertical speeds) was calculated and it showed that the Malibu was traveling at 98 kts decreasing to 80 kts during the turn to the base leg. The speed continued to decrease and during the last 8 seconds of flight, the speed was below 70 kts.

The video study also analyzed the location of the second airplane (Cessna) that taxied onto runway 27 and departed as the Malibu turned onto the base leg. The video was analyzed to determine how much distance was between the two airplanes during the accident sequence. At time 5:06 in the video, an object is seen moving east to west and is assumed to be the departing Cessna on runway 27. It is only seen for a fraction of a second because the camera view was obstructed. Because the Cessna was on the ground and far from the camera, its image in the video is only a barely visible moving dot. The straight line distance between the Cessna, when it was seen on the video, and the Malibu, which was on its base leg, was about 1,570 ft. The analysis indicated that to keep a 1,500 ft distance between the two airplanes,

if the Malibu had completed its turn to final which would take 9.4 seconds, the Cessna would have to move to the west at an average speed of 45.7 kts.

ADDITIONAL INFORMATION

Angle of Bank vs Airspeed

The Piper Malibu PA-46-310P Pilot's Operating Handbook (POH) figure 5-3 lists stall speeds corrected for aircraft bank angle. The stall speed for a Piper PA-46-310P at 4,100 lbs with gear and flaps down at 0 degrees angle of bank is 59 kts. With the same configuration, it shows the stall speed is 86 kts at 60 degrees of bank, and would have been higher at an angle of bank greater than 60 degrees.

The "Airplane Flying Handbook FAA-H-8083-3A" provided the following information about accelerated stalls:

"Though the stalls just discussed normally occur at a specific airspeed, the pilot must thoroughly understand that all stalls result solely from attempts to fly at excessively high angles of attack. During flight, the angle of attack of an airplane wing is determined by a number of factors, the most important of which are airspeed, the gross weight of the airplane, and the load factors imposed by maneuvering."

"At the same gross weight, airplane configuration, and power setting, a given airplane will consistently stall at the same indicated airspeed if no acceleration is involved. The airplane will, however, stall at a higher indicated airspeed when excessive maneuvering loads are imposed by steep turns, pull-ups, or other abrupt changes in the flight path. Stalls entered from such flight situations are called 'accelerated maneuver stalls,' a term, which has no reference to the airspeeds involved."

EAA AirVenture 2015 NOTAM

The EAA AirVenture 2015 NOTAM stated the following concerning landing approach at Oshkosh:

"A waiver has been issued reducing arrival and departure separation standards for category 1 and 2 aircraft (primarily single-engine and light twin-engine aircraft).

Pilots should be prepared for a combination of maneuvers that may include a short approach with descending turns, followed by a touchdown at a point specified by ATC which may be almost halfway down the runway. Use extra caution to maintain a safe airspeed throughout the approach to landing."

The NOTAM stated: "If a go-around is needed, notify ATC immediately for resequencing instructions." It also stated, "Maintain a safe airspeed and avoid low turns on landing approach."

Pilot Information

Certificate:	Private	**Age:**	46,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	December 3, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 16, 2015
Flight Time:	934 hours (Total, all aircraft), 130 hours (Total, this make and model), 833 hours (Pilot In Command, all aircraft), 10 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N4BP
Model/Series:	PA-46-310P	**Aircraft Category:**	Airplane
Year of Manufacture:	1984	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	46-8408065
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	November 12, 2014 Annual	**Certified Max Gross Wt.:**	4101 lbs
Time Since Last Inspection:	32 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	5792 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors
ELT:	C91 installed, not activated	**Engine Model/Series:**	TSIO-550C (1)
Registered Owner:	DLM HOLDING GROUP LLC	**Rated Power:**	300 Horsepower
Operator:	Kenneth Kaminski	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	OSH,808 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	07:40 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.96 inches Hg	**Temperature/Dew Point:**	19°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Benton Harbor, MI (BEH)	**Type of Flight Plan Filed:**	VFR
Destination:	Oshkosh, WI (OSH)	**Type of Clearance:**	VFR
Departure Time:	07:30 Local	**Type of Airspace:**	

Airport Information

Airport:	Wittman Regional Airport OSH	**Runway Surface Type:**	Concrete
Airport Elevation:	808 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	27	**IFR Approach:**	None
Runway Length/Width:	6179 ft / 150 ft	**VFR Approach/Landing:**	Full stop

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Serious, 2 Minor	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	3 Serious, 2 Minor	**Latitude, Longitude:**	43.99139,-88.548614(est)

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Tim Anderson; FAA Milwaukee FSDO; Milwaukee , WI Mike Council; Continental Motors; Mobile, AL Vincent Zarrella; Piper Aircraft; Vera Beach, FL
Original Publish Date:	March 9, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91607

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