



# Aviation Investigation Final Report

<b>Location:</b>	Lewiston, Idaho	<b>Accident Number:</b>	WPR21FA283
<b>Date &amp; Time:</b>	July 24, 2021, 11:52 Local	<b>Registration:</b>	N28U
<b>Aircraft:</b>	SIAI-MARCHETTI SM-1019B	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The pilot was attempting an intersection takeoff about midfield when, shortly after the airplane became airborne, it pitched up aggressively, rolled left, and descended into the ground in a nose-down attitude.

Examination did not reveal any evidence of preaccident malfunctions or failures of the flight control system, and there was no evidence to indicate that the pilot's seat had moved. Both the engine and propeller exhibited damage signatures consistent with high engine power at impact.

The airplane was equipped with a flight control locking system that comprised a pivoting, U-shaped control lock tube mounted permanently to the rudder pedal assembly and a forward-facing locking arm mounted to the pilot's control stick. The control lock immobilized the aileron and elevator controls but still allowed for near-full movement of the rudder and tailwheel.

The cabin floor, where the control lock tube should have been mounted for flight, was severely deformed and compressed. Had the lock been stowed during impact, it would have been pinned under the flight control stick, crushed longitudinally, and its retaining clip would have been deformed; however, the control lock and its retaining clip were essentially undamaged, and the lock was found raised off the floor. The locking arm on the control stick also showed no evidence of deformation or impact damage but had rotated about 90° to the right of its normal position, as if forced into that position on impact while the control lock was still attached.

Given this information, it is likely that the control lock was installed on the flight control stick during takeoff and impact. High-resolution security camera footage of the accident revealed no discernable movement of the elevators or ailerons, further suggesting that the flight controls were immobilized by the control lock.

Although the control lock is painted red, its orientation when engaged results in the pilot viewing it directly down its length, at its narrowest profile. A pilot who owned a similar airplane stated that he had once become distracted during preflight checks and was able to taxi, initiate takeoff, and become airborne with the control lock engaged. He stated that, once he realized his mistake, removal of the lock was a struggle due to the forces imposed on the control stick during takeoff.

The pitch trim was found in an almost full nose-down position, suggesting that the pilot may have been attempting to use the trim to arrest the airplane's increasing nose-up attitude due to the locked control stick. Whether the pilot recognized that the control lock was engaged or believed he had a flight control problem could not be determined. Regardless, after takeoff during a dynamic and transitional phase of flight, there would have been minimal time to accurately diagnose the issue and disconnect the control lock.

The intended purpose and destination of the flight was routine and there was no apparent time pressure present. The pilot was reported to be extremely thorough about performing preflight checks, and according to his wife, the expected duration of his normal preflight activities would not have allowed him to depart when he did. The pilot had limited experience in the accident airplane, which could explain why he did not remove the control lock during the preflight inspection. There was no video evidence to provide insight into the duration and scope of the pilot's preflight inspection; however, omission of the preflight control check was uncharacteristic given his extensive flight experience, and the reason it was not performed could not be determined. While omission of the control check is consistent with a pilot rushing or distracted, and the short duration from taxi to takeoff would have reduced this pilot's opportunity to detect his error, the investigation was not able to determine the reason it was not performed. Had the pilot completed a functional check of the controls before initiating takeoff, the presence of the lock would have been detected and the accident would have been prevented.

Although the pilot's autopsy demonstrated the presence of heart disease, which posed an increased risk of an impairing or incapacitating cardiac event, heart disease is unlikely to have caused inattention. It is also unlikely that the pilot was incapacitated by a cardiac event because his final radio transmission showed that he was aware and speaking after the onset of loss of control. Thus, it is unlikely that the pilot's heart disease contributed to the accident.

## **Probable Cause and Findings**

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

The pilot's failure to remove the flight control lock before departure, which resulted in a loss of airplane control and impact with terrain. Contributing to the accident was his failure to perform an adequate preflight inspection and flight control check before takeoff.

## Findings

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<b>Personnel issues</b>	Use of equip/system - Pilot
<b>Personnel issues</b>	Use of checklist - Pilot
<b>Personnel issues</b>	Preflight inspection - Pilot
<b>Aircraft</b>	Gust lock or damper - Incorrect use/operation
<b>Aircraft</b>	Pitch control - Attain/maintain not possible
<b>Personnel issues</b>	Forgotten action/omission - Pilot

## Factual Information

### History of Flight

Initial climb	Loss of control in flight (Defining event)
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On July 24, 2021, about 1152 Pacific daylight time, a SIAI Marchetti SM-1019B, N28U, was substantially damaged when it was involved in an accident at Lewiston-Nez Perce County Airport (LWS), Lewiston, Idaho. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the pilot's wife, the pilot planned to fly to Hungry Ridge Ranch Airport (37ID), Grangeville, Idaho, where he owned a residence. She stated that the pilot was in no hurry, and there was no time-sensitive reason for him to be at the destination.

Airport security video cameras located at the main passenger terminal captured the airplane positioned on runway 12 at the intersection of taxiway D before takeoff. The airplane began the takeoff roll and continued about 400 ft down the runway before taking off in a three-point departure configuration. The airplane pitched nose-up to about 45° while climbing to an altitude of about 80 ft above ground level, after which it rolled 90° to the left as the nose dropped. The airplane continued to roll left while descending and impacted the ground in a nose-down, left-wing-low attitude between runway 12 and taxiway C, about 970 ft beyond where the takeoff roll began. A postimpact fire ensued.

Witnesses located at the airport described the airplane taking off normally before it aggressively pitched up and rolled left.

## Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	72, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	October 1, 2020
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 6500 hours (Total, all aircraft), 20 hours (Total, this make and model)		

The pilot was a retired naval aviator, and current air show performer, with extensive flight experience in a broad range of aircraft. He held a commercial pilot certificate with ratings for airplane single-engine land and sea, airplane multi-engine land, and instrument airplane. At the time of his last medical examination, on October 29, 2020, he reported 6,500 total hours of civilian flight experience. The pilot's logbooks were not available for review.

The pilot purchased the airplane on April 21, 2021, and it was delivered to him in June by a friend, who was also a flight instructor. The instructor flew with the pilot for the first flight after delivery, during which they performed slow flight, stalls, steep turns, and multiple stop-and-go landings. The instructor stated that the pilot demonstrated proficiency in the operation of the airplane, and at no time did he need to take the controls. The instructor stated that, before their first flight, the pilot performed a very thorough and detailed walk-around, lasting approximately 90 minutes. He was particularly impressed with his "exemplary" checklist discipline, both during that flight, and when he had flown with the pilot previously. During the preflight, he observed the pilot perform a full check of the flight controls to verify proper movement and operation. They discussed the control lock operation, and the pilot stated that it was very similar to the lock used on other airplanes he had owned and flown.

Varying accounts indicated that the pilot had flown the airplane about twenty times since purchase. The pilot's wife had flown with him to LWS earlier in the day in their other airplane. She stated that she left him at the airport at 1110, at which time the accident airplane was still in the hangar. She stated that normally he would perform preflight checks after the airplane had been pulled out of the hangar, and that he was methodical and slow. She expressed surprise that he could have performed all his checks and still departed by the accident time.

The general manager for the fixed base operator (FBO) next to the hangar where the pilot stored his airplane stated that he had known the pilot for many years, and that he routinely observed him perform an engine runup at the approach end of the runway before takeoff in all the airplanes he flew. He stated that he had never seen the pilot perform an intersection takeoff from midfield, and that the pilot's preflight inspections took a very long time.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	SIAI-MARCHETTI	<b>Registration:</b>	N28U
<b>Model/Series:</b>	SM-1019B	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1977	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	None	<b>Serial Number:</b>	06502002
<b>Landing Gear Type:</b>	Tailwheel	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	May 3, 2021 Condition	<b>Certified Max Gross Wt.:</b>	2800 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo prop
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Rolls Royce/Allison
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	250-B17B
<b>Registered Owner:</b>	JACKSON 50 LLC	<b>Rated Power:</b>	400 Horsepower
<b>Operator:</b>	JACKSON 50 LLC	<b>Operating Certificate(s) Held:</b>	None
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	N/A

The airplane was manufactured in Italy in 1977, imported into the United States in 1997, and issued an experimental-exhibition special airworthiness certificate in February 1998.

The airplane was a single-engine, all-metal, high-wing, with a fixed tailwheel landing gear configuration. The cabin was enclosed and was equipped with conventional flight controls for two pilots in a tandem configuration. It had been upgraded with the installation of an avionics suite and autopilot. It was equipped with a 400-shaft-horsepower Allison M250-B17B turbine engine.

The last condition inspection was completed on May 3, 2021, at an airplane total time of 509.5 hours of operation.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KLWS,1436 ft msl	<b>Distance from Accident Site:</b>	0 Nautical Miles
<b>Observation Time:</b>	11:56 Local	<b>Direction from Accident Site:</b>	244°
<b>Lowest Cloud Condition:</b>	Scattered / 6000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	Unknown / Unknown
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	Unknown / Unknown
<b>Altimeter Setting:</b>	30.09 inches Hg	<b>Temperature/Dew Point:</b>	30°C / 2°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Lewiston, ID	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Grangeville, ID (37ID)	<b>Type of Clearance:</b>	VFR
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class C

## Airport Information

<b>Airport:</b>	LEWISTON-NEZ PERCE COUNTY LWS	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	1442 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	12	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	5003 ft / 75 ft	<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	46.376415,-117.01176(est)

The initial impact point was an area of disturbed ground consistent with a left wing strike about 30 ft from the main wreckage. A large, shallow impact crater, consistent with impact from the engine, was found between the initial impact point and the main wreckage. The wings sustained impact and thermal damage and remained partially attached to the fuselage. The

forward fuselage sustained thermal damage and crush damage focused on the left side. The engine remained attached to the airframe. The propeller assembly separated from the engine and was found on the runway adjacent to the debris field.

Disassembly of the engine revealed evidence that it was producing power at impact, including torsional overload of the turbine to compressor coupling and power turbine to pinion gear shaft, along with multiple compressor blade stages that displayed detached airfoils that were bent opposite the direction of rotation.

The propeller blades exhibited signatures of stoppage at high power and high impact angle, including chordwise/rotational scoring, leading edge gouges, and compound twisting and bending opposite the direction of rotation.

The pilot's seat remained engaged and locked to both of its seat rails and was just forward of the midrange position. The forward and aft seat stops were intact and undamaged. The rear seat was in the center of its travel range, and similarly attached and engaged to both of its seat rails.

The left and right elevators remained attached to each other and the control cable bellcrank. Elevator control cable continuity was established from the bellcrank assembly to the aft control stick, which remained connected to the forward stick via its interconnect tube.

The left elevator was fitted with a servo tab, which was intact and remained connected to the elevator assembly. The right elevator was equipped with a pilot-controlled trim tab operated by a cable-driven jackscrew in the right horizontal stabilizer. The trim tab was electrically-controlled through a switch located in each control stick, with provisions for manual control through a wheel positioned on the left side of the pilot's station. The jackscrew extension length corresponded to the tab being set to an almost full tab-up (airplane nose-down) position.

The only undamaged component of the autopilot was the Garmin GSA-28 elevator pitch control servo. It remained firmly attached to its mounting pad in the aft fuselage. The unit appeared appropriately connected to the elevator control system via its bridle cables, and there was no evidence of binding or seizure. The unit was removed, disassembled, and examined, and no anomalies were noted.

Within the airframe, all flight control cable pulleys that were not damaged by fire or impinged during impact were intact and moved smoothly with no binding noted. There was no evidence of cable-to-fuselage interference, and there were no foreign objects within the floor pan or in the aft fuselage or empennage.

Both flaps sustained varying degrees of thermal and impact damage; their drive actuators corresponded to a flap extension of 30°.

The airplane was equipped with a flight control locking system that comprised a pivoting, U-shaped control lock tube mounted permanently to the rudder pedal assembly, and a forward-facing locking arm and pin assembly mounted to the control stick. To engage the system, and lock the flight controls, the control lock is raised to the locking arm, where it engages with a pin



to keep the control stick secure. For flight, the control lock is lifted from the pin, and then pivots to the floor, where it is secured in place with a retainer clip near the base of the control stick. The control lock immobilizes the aileron and elevator controls and holds the rudder in the neutral position, but still allows for near-full movement of the rudder and tailwheel via the rudder pedals.

Within the forward airframe, the flight control lock remained connected to the rudder pedal assembly, was intact, and found in the raised position near the lower edge of the instrument panel. The cabin floor forward of the control stick base, which would have been occupied by the 14-inch-long control lock when not in use, was compressed aft such that the base of the control stick was 4 inches away from the control lock pivots on the rudder pedal assembly. The control lock floor retainer clip, which would have been used to lock the control lock to the floor for flight, was undamaged.

The locking arm and pin assembly remained attached to the control stick and was undamaged, but had rotated 90° to the right of its original position. There was no evidence of contact between the locking arm and pin assembly with any components or structure in the footwell or instrument panel.

The examination of the airframe and engine revealed no evidence of preaccident mechanical malfunctions or failures that would have precluded normal operation.

## Communications

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At 1150:15, the pilot made initial contact with ground control at LWS. Eight seconds later, he requested taxi clearance from the FBO ramp for a runway 12 departure at the taxiway D intersection (located about 900 ft from the FBO hangar where the airplane was stored). The controller then instructed the pilot to taxi via taxiway D. At 1150:48, while still on the ground frequency, the pilot asked if he was cleared for takeoff, and about 20 seconds later (after communicating with another aircraft) the controller replied and cleared the pilot for takeoff from runway 12 at taxiway D. The pilot responded, and the controller requested that he switch to the tower control frequency. After apologizing, the pilot contacted the tower controller. The tower controller confirmed contact with the pilot and cleared the airplane for takeoff. At 1151:41, the pilot replied, “for takeoff,” and 36 seconds later, at 1152:17, expletives were heard.

Relatives and acquaintances of the pilot who listened to the audio recordings of the ATC communications stated that the expletives came from the pilot.

## Medical and Pathological Information

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On his most recent Federal Aviation Administration (FAA) medical certificate application, the pilot reported using the prescription medication lisinopril to treat high blood pressure, for which he was qualified under Conditions Aviation Medical Examiners Can Issue (CACI) criteria. He also reported using the prescription medication levothyroxine to treat low thyroid hormone, for which he was also CACI qualified. Lisinopril and levothyroxine generally are not considered impairing. No significant issues were identified, and the pilot was issued a second-class medical certificate limited by a requirement to have available glasses for near vision.

The Spokane County Office of the Medical Examiner performed the pilot's autopsy. According to the autopsy report, the cause of death was blunt force injuries. The autopsy revealed the presence of heart disease, with the heart being described as dilated, and mild coronary artery narrowing present. The autopsy did not identify any other significant natural disease.

Toxicology testing on specimens from the pilot by both the FAA Forensic Sciences Laboratory and NMS Labs (on behalf of the Office of the Medical Examiner) revealed negative results, and ethanol was not detected in peripheral blood.

## Tests and Research

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### Flight Control Lock

Examination of a similar airplane confirmed that, with the control lock engaged, although the ailerons and elevators were completely locked, the rudder and tailwheel could still be moved to near full travel, such that the airplane could be maneuvered almost completely unhindered while taxiing. Although the control lock is painted red, the pilot's view of the lock in the engaged position is such that the lock is viewed at its narrowest profile, directly down its length.

Another 1019 series airplane owner relayed his experience with the flight control lock. He stated that, on one occasion, he had planned a local flight with a passenger in the back seat and became distracted and forgot to remove the flight control lock before flight. He was able to taxi for departure, still unaware that the lock was in place, and became distracted during the pre-takeoff checks because he was talking to the passenger. He stated that he was able to complete the initial stages of takeoff with the control lock engaged, and once he realized, he had to

struggle to remove the lock due to the forces on the control stick during takeoff. After a few seconds he was able to free it, and the flight progressed uneventfully.

The pilot's friend, who had delivered the airplane, stated that you could easily get into the airplane with the control lock engaged. He further stated that, like most tailwheel-equipped airplanes, heavy differential braking was required to steer the airplane, and only limited rudder movement was required. Following the accident, he performed a series of checks in a similar airplane with the control lock attached. He determined that the airplane could be taxied uninhibited with the control lock engaged. With the control lock engaged and the airplane parked, he could not remove it with reasonable force if there was any control pressure on the stick, because it appeared to hang up on the lock pin until he released pressure.

A section of the forward flight control stick, locking arm and pin assembly, and the flight control lock were sent to the NTSB Materials Laboratory for further examination. The examination revealed normal wear between the control lock arm and pin assembly and the flight control lock's pin hole. The control lock exhibited a slight longitudinal twist where it had connected to the buckled cabin floor, but was otherwise undamaged, and there was no apparent deformation to the control lock arm and pin assembly.

#### Airport Security Video

The high resolution of the airport security video cameras and the proximity of the airplane to their location allowed for a relatively accurate estimation of the deflections of the flight control surfaces during the takeoff. Review of the footage revealed that the deflections of the elevator and ailerons were either zero, or so small that they could not be seen. The airplane's flaps were identified in an extended position.

### **Additional Information**

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#### Flight Manual

The airplane's flight manual was located in the airplane after the accident. The preflight check section contained an item for removing the flight control lock.

The before take-off section stated that the pilot should, "check for freedom of movement and maximum range of travel in both directions."

The flight characteristics section described aircraft control with the trim system, and stated:

*Trim changes caused by flap movements are notable. However, the aircraft can always be controlled by using non excessive stick forces. A maximum of 4 to 5 kg in force variations is possible. In any case, these forces are quickly avoidable by the use of trim. Flap extension causes nose-up moment. During flap maneuvering it is possible to keep the stick longitudinal force almost nil at any moment by keeping the electric trim button pushed down in the opposite direction. Trim changes due to variations in engine rpm are much slighter, although remaining noticeable. An increase in power causes nose-up moment. Even without using the trim the aircraft remains perfectly controllable by means of slight stick movements.*

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Swick, Andrew
<b>Additional Participating Persons:</b>	Nick Shepler; Rolls-Royce; Indianapolis, IN Les Doud; Hartzell Propeller Chad Anderson; FAA-FSDO; Spokane, WA
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<b>Investigation Class:</b>	<a href="#">Class 3</a>
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<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=103534">https://data.nts.gov/Docket?ProjectID=103534</a>

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