



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	LAKELAND, FL	<b>Accident Number:</b>	MIA97LA056
<b>Date &amp; Time:</b>	01/02/1997, 1121 EST	<b>Registration:</b>	N441MS
<b>Aircraft:</b>	Cessna 441	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	2 Minor
<b>Flight Conducted Under:</b>	Part 91: General Aviation -		

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## Analysis

During the takeoff roll the pilot stated the right engine had an over torque condition and he was unable to control the aircraft. The aircraft went off the runway to the left and crashed coming to rest upright. A post crash fire erupted and destroyed the aircraft. The mechanic-rated passenger stated he was observing the right engine gauges during this maintenance test flight and did not observe any over torque indications. When he looked up from the instruments at about the time the aircraft should lift off, the aircraft was drifting to the left. The pilot, who was looking at the engine instruments, looked up, saw the aircraft was about to drift off the runway, and retarded both power levers. The passenger/mechanic (who was also a pilot) reported that the pilot placed the propellers in reverse. Six thousand feet of runway remained at the abort point. The aircraft pitched up and then crashed on the left wing and nose. Cessna Service Newsletter SLN99-15 and AlliedSignal Operating Information Letter OI 331-17 report an abnormality that may affect the model engine in which an uncommanded engine fuel flow increase or fluctuation may occur, resulting in an unexpected high torque and asymmetric thrust. The condition is associated with an open torque motor circuit within the engine fuel control. A system malfunction resulting in engine acceleration to maximum power would produce an overtorque of about 2,288 foot-pounds (ft-lb). This power output is restricted by a fuel flow stop in the engine fuel control. Normal takeoff power is 1,669 ft-lbs; therefore, one engine accelerating to the stop limit while one engine continued to operate normally would cause a torque differential of 619 ft-lbs. The total loss of power in one engine during takeoff while one engine continued to operate normally would result in a torque differential of 1,669 ft-lbs. The Cessna 441 Flight Manual states that at 91 knots indicated airspeed, the airplane is controllable with one engine inoperative (that is, with a torque differential between engines of up to 1,669 ft-lbs). However, if an electronic engine control failure occurs on one engine and the other engine is retarded to idle, the fuel flow to the failed engine will not be reduced, and a torque differential of about 2,288 ft-lbs will occur, at which point the airplane is uncontrollable by the pilot.

## Probable Cause and Findings

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

Failure of the electronic engine control, which caused an overtorque condition in the right engine that made directional control of the airplane not possible by the pilot when the power to the left engine was retarded to idle during the takeoff roll.

## Findings

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Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: TAKEOFF - ROLL/RUN

### Findings

1. FUEL SYSTEM,FUEL CONTROL - MALFUNCTION
2. 1 ENGINE - OVERTORQUE
3. THROTTLE/POWER CONTROL - NOT POSSIBLE - PILOT IN COMMAND

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Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL

Phase of Operation: TAKEOFF - ROLL/RUN

### Findings

4. 1 ENGINE
5. THROTTLE/POWER CONTROL - REDUCED - PILOT IN COMMAND

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Occurrence #3: LOSS OF CONTROL - ON GROUND/WATER

Phase of Operation: TAKEOFF - ROLL/RUN

### Findings

6. DIRECTIONAL CONTROL - NOT POSSIBLE - PILOT IN COMMAND
7. AIRCRAFT CONTROL - NOT POSSIBLE - PILOT IN COMMAND

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Occurrence #4: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER

Phase of Operation: TAKEOFF - ABORTED

## Factual Information

On January 2, 1997, about 1121 eastern standard time, a Cessna 441, N441MS, registered to S & S Limited, Inc., crashed during takeoff from Lakeland Linder Regional Airport, Lakeland, Florida, while on a Title 14 CFR Part 91 maintenance test flight. Visual meteorological conditions prevailed at the time and no flight plan was filed. The aircraft was destroyed and the airline transport-rated pilot and mechanic-rated passenger received minor injuries. The flight was originating at the time of the accident.

The pilot stated he and the mechanic-rated passenger had performed a maintenance test flight earlier on the day of the accident. During takeoff on that test flight, the torque limiter on the right engine was not operating properly and he had to set the maximum torque manually with the power lever. After takeoff they climbed to 22,000 feet and began taking engine readings in preparation for a negative torque system (NTS) shutdown test. Suddenly the aircraft yawed to the left and the right engine torque gauge was indicating over redline. He retarded the power lever and after about 5 or 6 seconds the engine torque came back. He then elected to terminate the flight and return to the airport.

The pilot stated that after landing he informed the president of the maintenance company, who was conducting the work on the aircraft, about the uncontrolled over torque. The president acknowledged this and stated it would be looked at. He also stated the pilot would have to fly the aircraft again to perform the NTS shutdown test.

When the pilot returned a few hours later he inquired of maintenance personnel what they had found wrong with the aircraft. They stated they found nothing wrong that would cause an engine over torque. They stated they did adjust the right propeller governor.

The pilot and the mechanic-rated passenger departed for the second test flight. The pilot stated that on takeoff the right engine torque limiter was still not set and he again had to set maximum torque with the power lever. With both engines set to maximum torque the aircraft accelerated to about 90 knots. At this time the aircraft yawed to the left accompanied by an increase of the right torque gauge to above redline. He retarded the both power levers to abort the takeoff. The right engine did not respond. He attempted to maintain directional control but the aircraft continued to the left off the runway.

When the aircraft came to rest the left engine was still running and there was fire around the left engine and the left side of the airplane. He shut down the engines and followed the passenger out the rear cabin door. After running across the taxiway he turned around and observed the entire aircraft on fire. A National Guard fire truck arrived about 5 minutes after the accident and the City of Lakeland fire trucks arrived about 15 minutes after the accident.

The mechanic-rated passenger stated that on the first test flight he noticed the right engine rpm was about .3 percent high and the right engine EGT was 10 degrees higher than the left. The engine torques were normal and he did not notice the right engine over torque. They returned to the airport after this flight and he adjusted the right engine propeller governor to bring the rpm down.

The passenger stated that during takeoff on the second flight, the condition levers were positioned at takeoff and the power levers were moved forward. He watched the engine instruments and the torque indications for both engines increase evenly and settle on full torque of 1,669 foot pounds. As they approached takeoff speed he focused his attention on the

runway. When he looked up the aircraft was headed left off the runway center line. As the takeoff continued, at about 90 knots the aircraft was headed directly at the grass to the left of the runway.

He looked at the pilot who was looking at the engine instruments. As the pilot looked up he noticed the position of the aircraft and yelled out. He then pulled both power levers to full reverse just before the aircraft entered the grass. The aircraft lifted from the ground and the right wing came over the left wing. The aircraft crashed to the ground on the nose and tumbled left wing over right wing. The aircraft then came to rest on the landing gear. After the aircraft came to rest, both engines and the nose of the aircraft were on fire. He exited the aircraft followed by the pilot. He stated during takeoff, prior to the aircraft leaving the ground, all engine instrumentation indicated a normal takeoff.

A witness observed the aircraft during the takeoff roll. After rotation the aircraft climbed to about 50 feet above the runway. At this point the aircraft began to yaw to the left and the left wing dropped down. The aircraft impacted the ground left wing first followed by the nose. The aircraft then cartwheeled and came to rest upright. A fire erupted in the aft end of the left engine and spread under the aircraft. After the occupants exited the aircraft, the fire flared up.

Postcrash teardown examination of the left engine showed that the engine had sustained postcrash fire damage in the gearbox and compressor inlet area. The first stage compressor blades had sustained fire damage. All remaining compressor wheels and blades were in place. All turbine wheels and blades were in place and the engine assembly rotated. All gears were in place within the gearbox and it rotated normally. All accessory drives operated normally as the gearbox turned. The drive coupling between the engine and gearbox was sheared in overstress, consistent with typical damage from sudden stoppage of the propeller.

Postcrash teardown examination of the right engine showed the engine assembly rotated normally and all compressor wheels and blades and all turbine wheels and blades were in place. The drive coupling between the engine and gearbox was in place. The gearbox rotated normally and all accessory drives turned when the gearbox was turned.

Teardown examination of the left propeller showed no discrepancies that would have precluded normal propeller operation. The blade angle of the propeller at ground impact could not be determined; however, damage to the propeller was consistent with the propeller not being in the reverse range at ground impact. Teardown examination of the right propeller showed no discrepancies that would have precluded normal propeller operation. Damage to the right propeller was consistent with the propeller moving toward the feathered position or in the feathered position at ground impact. A representative from Hartzell Propeller stated that as the propellers on the Cessna 441 are placed in the reverse range, it gives the aircraft a definite pitch down moment. (See Hartzell Propeller report).

Postcrash testing of the propeller governors was performed under FAA supervision at Woodward Governor Company, Rockton, Illinois. Each governor operated within normal specifications when placed on a test machine. (See Woodward Governor Company report).

After testing of the propeller governors at Woodward Governor Company, the governors, along with the fuel controls and fuel pumps from each engine were forwarded to Allied Signal Engines. Testing and teardown examination of these components was performed under FAA supervision. No discrepancies which would cause a mechanical failure or malfunction of any of these components was found. (See Allied Signal Engines report).

Cessna Service Newsletter SLN99-15 and AlliedSignal Operating Information Letter OI 331-17 report an abnormality that may affect the model engine in which an uncommanded engine fuel flow increase or fluctuation may occur, resulting in an unexpected high torque and asymmetric thrust. The condition is associated with an open torque motor circuit within the engine fuel control.

The differential in torque between one engine at takeoff power and one engine at maximum power is 619 foot pounds of torque. Following failure of one engine during takeoff, the differential in torque between engines would be 1,669 foot pounds. The Cessna Aircraft flight manual for the Cessna 441 states that at 91 knots indicated airspeed, the aircraft is controllable with one engine inoperative. (See pages from Cessna 441 flight manual). The differential in torque between one engine at idle and one engine at maximum power is about 2,288 foot pounds, and, with that differential in torque, directional control cannot be maintained at 90 knots indicated airspeed.

### Pilot Information

<b>Certificate:</b>	Airline Transport	<b>Age:</b>	51, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	05/21/1996
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	6511 hours (Total, all aircraft), 533 hours (Total, this make and model), 6055 hours (Pilot In Command, all aircraft), 82 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N441MS
Model/Series:	441 441	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	4410056
Landing Gear Type:	Retractable - Tricycle	Seats:	11
Date/Type of Last Inspection:	12/23/1996, AAIP	Certified Max Gross Wt.:	9850 lbs
Time Since Last Inspection:	2 Hours	Engines:	2 Turbo Prop
Airframe Total Time:	4697 Hours	Engine Manufacturer:	Garrett
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	TPE-331-8
Registered Owner:	S & S LIMITED, INC.	Rated Power:	635 hp
Operator:	EXECUTIVE WINGS	Operating Certificate(s) Held:	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	LAL, 142 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	1123 EST	Direction from Accident Site:	90°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	15 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:	Variable	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	24° C / 16° C
Precipitation and Obscuration:			
Departure Point:	(LAL)	Type of Flight Plan Filed:	IFR
Destination:		Type of Clearance:	IFR
Departure Time:	1121 EST	Type of Airspace:	Class D

## Airport Information

Airport:	LAKELAND LINDER REGIONAL (LAL)	Runway Surface Type:	Asphalt
Airport Elevation:	142 ft	Runway Surface Condition:	Dry
Runway Used:	9	IFR Approach:	
Runway Length/Width:	8500 ft / 150 ft	VFR Approach/Landing:	

## Wreckage and Impact Information

Crew Injuries:	2 Minor	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Minor	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	JEFFREY L KENNEDY	Report Date:	08/01/2001
Additional Participating Persons:	DUANE KINCAID; ORLANDO, FL RICHARD D MILEHAM; WEST CHICAGO, IL MICHAEL GONZALEZ; SCOTTSDALE, AZ		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).