



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Cresco, IA	<b>Accident Number:</b>	CHI06FA193
<b>Date &amp; Time:</b>	07/19/2006, 1104 CDT	<b>Registration:</b>	N636SE
<b>Aircraft:</b>	Cessna 560	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	2 Fatal, 2 Serious
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Personal		

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## Analysis

The airplane was managed by and listed on the certificate of Jackson Air Charter, Inc. (JAC), a 14 Code of Federal Regulations (CFR) Part 135 on-demand operator; however, because the owner of the airplane was using it for personal use, the accident flight was flown under 14 CFR Part 91 regulations. The right-seat pilot, who was the chief pilot for JAC, was the flying pilot for the flight. The right-seat pilot had about 13,312 total flight hours, 833 hours of which were in Cessna 560 airplanes. The left-seat pilot, who was the nonflying pilot for the flight and had only worked for JAC for a little over a month, had not yet completed the company's Part 135 training but was scheduled to do so. The left-seat pilot had about 11,607 total flight hours, 557 hours of which were in Cessna 560 airplanes.

The flight was planned to land at Rochester International Airport (RST), Rochester, Minnesota. The flight crew attempted to circumnavigate severe weather conditions and continue the planned descent for about 15 minutes even though a Minneapolis Air Route Traffic Control Center controller stated that the flight would have to deviate 100 miles or more to the north or 80 miles to the south to do so. The RST approach controller subsequently told the flight crew that there was "weather," including wind gusts, along the final approach course, and on-board radar and weather advisories also showed severe thunderstorms and wind gusts in the area. Given the overwhelming evidence of severe weather conditions around RST, the flight crew exhibited poor aeronautical decision-making by attempting to continue the preplanned descent to RST despite being aware of the severe weather conditions and by not diverting to a suitable airport earlier in the flight.

The cockpit voice recorder (CVR) recorded the flight crew begin discussing an alternate destination airport about 3 minutes after contacting RST approach; however, the CVR did not record the left-seat pilot adequately communicate to air traffic control that the flight was going to divert. CVR evidence also showed that neither pilot took a leadership role during the decision-making process regarding the diversion. As a result, the flight crew chose an alternate airport, Ellen Church Field Airport (CJJ), Cresco, Iowa, from either looking at a map or seeing it out the cockpit window. The flight crew was not familiar with the airport, which did not have weather reporting capabilities. CVR evidence indicates that the flight crew did not use the on-

board resources, such as the flight management system and navigational charts, to get critical information about CJJ, including runway direction and length. Further, the flight crew did not use on-airport resources, such as the wind indicator located on the left side of runway 33.

During the approach and landing, the enhanced ground proximity warning system (EGPWS) alerted in the cockpit. However, the flight crew did not recognize or respond to the EGPWS warning, which alerted because the EGPWS did not recognize the runway since it was less than 3,500 feet long. CVR evidence indicated that the flight crew incorrectly attributed the warning to the descent rate. Further, the runway was not depicted on an on-board non-navigational publication, which only contained runways that were 3,000 feet or more long, and this was referenced and noted by the flight crew. In addition, the flight crew visually recognized during the final approach that the runway was shorter than the at least 5,000 feet they originally believed it to be (as stated by the right-seat pilot earlier in the flight). Despite all of these indications that the runway was not long enough to land safely, the flight crew continued the descent and landing. (After the accident, Cessna computed the landing distance for the accident conditions, which indicated that about 5,200 feet would have been required to stop the airplane on a wet runway with a 10-knot tailwind. Runway 33 is only 2,949 feet long. Further, the Cessna Aircraft Flight Manual does not recommend landing on precipitation-covered runways with any tailwind component.) Because the flight crew did not look up the runway length and did not heed indications that the runway was too short, both of which are further evidence of the flight crew's poor aeronautical decision-making, they landed with inadequate runway length to either land the airplane on the runway or abort the landing. Subsequently, the airplane exited the runway and continued about 1,700 feet beyond its end. The airplane had sufficient fuel to have proceeded to an airport with a suitable runway length.

In addition to the poor decision-making, the flight crew did not exhibit adequate crew resource management (CRM) throughout the flight. For example, the flight crew exhibited poor communication and decision-making skills, did not effectively use the available on-board resources to get information about the landing runway, and neither pilot took a leadership role during the flight. JAC did not have and was not required to have an approved CRM training program although, according to company pilots, some CRM training was incorporated into the company's simulator training.

On December 2, 2003, the National Transportation Safety Board issued Safety Recommendation A-03-52, which asked the Federal Aviation Administration (FAA) to require that 14 CFR Part 135 on-demand charter operators that conduct dual-pilot operations establish and implement an FAA-approved CRM training program for their flight crews in accordance with 14 CFR Part 121, subparts N and O. On May 2, 2006, Safety Recommendation A-03-52 was reiterated and classified "Open-Unacceptable Response" pending issuance of a final rule. Although the accident flight was operated under Part 91, if JAC, as an on-demand Part 135 operator, had provided all of its pilots CRM training, the benefits of such training would extend to the company's Part 91 flights. In November 2007, the Safety Board placed Safety Recommendation A-03-52 on its Most Wanted List of Transportation Safety Improvements because of continued accidents involving accident flight crewmembers. As a result of this accident, the Safety Board reiterated Safety Recommendation A-03-52 on May 1, 2008.

The right-seat pilot had in his possession multiple prescription and nonprescription painkillers, nonprescription allergy and anti-acid medications, and one prescription muscle

relaxant. None of these medications are considered illicit drugs and would not have been reportable on drug testing required under 49 CFR Part 40. The right-seat pilot was known to have problems with back pain, although no medical records of treatment for the condition could be located. On his most recent application for airman medical certificate, the pilot had reported no history of or treatment for any medical conditions and no use of any medications. Toxicology testing revealed recent use of a prescription muscle relaxant, which might have resulted in impairment. It is also possible that the right-seat pilot was impaired or distracted by the symptoms for which he was taking the muscle relaxant; however, it could not be determined what role the muscle relaxant or the physical symptoms might have played in this accident.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flight crew's inadequate aeronautical decision-making and poor crew resource management (CRM), including the inadequate use of the on-board sources (such as the flight management system and navigation charts), to get critical information about Ellen Church Field Airport, including runway direction and length. Contributing factors to the accident were the flight crew's failure to consider and understand indications that the runway length was insufficient and inadequate CRM training for pilots at Part 135 on-demand operators.

## Findings

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Occurrence #1: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER  
Phase of Operation: LANDING - ABORTED

### Findings

1. TERRAIN CONDITION - GROUND
2. (C) IN-FLIGHT PLANNING/DECISION - INADEQUATE - FLIGHTCREW
3. (C) CREW/GROUP COORDINATION - POOR - FLIGHTCREW
4. (F) INADEQUATE TRAINING - COMPANY/OPERATOR MANAGEMENT
5. (C) PERFORMANCE DATA - NOT CALCULATED - FLIGHTCREW

## Factual Information

### HISTORY OF FLIGHT

On July 19, 2006, at 1104 central daylight time, a Cessna 560, N636SE, received substantial damage on impact with terrain during an aborted landing on runway 33 (2,949 feet by 50 feet, concrete) at Ellen Church Field Airport (CJJ), Cresco, Iowa. The airplane was located in a cornfield about 1,751 feet north of the departure end of runway 33. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 flight was operating on an instrument flight rules (IFR) flight plan. Flight crew services were provided by Jackson Air Charter, Inc (JAC). The left seat pilot and right seat pilot received fatal injuries, and the two passengers received serious injuries. The flight last departed from University-Oxford Airport (UOX), Oxford, Mississippi, at 0920, and was en route to Rochester International Airport (RST), Rochester, Minnesota, when it diverted to CJJ.

The JAC Trip Sheet Information lists the following itinerary for four passengers, including the passengers aboard the accident flight.

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Depart from Jackson at 0600; Arrive Gulfport-Biloxi at 0639  
Depart from Gulfport-Biloxi at 0700; Arrive at Destin-Ft. Walton, Fla. at 0739  
Depart Destin-Ft. Walton at 0745; Arrive at Meridian, Miss. at 0830  
Depart from Key Field, Miss. at 0845; Arrive at Oxford, Miss., at 0924  
Depart from Oxford, Miss. at 1000; Arrive at Rochester, Minn. At 1151  
Depart from Rochester, Minn. at 1300; Arrive at Oxford, Miss. at 1445  
Depart from Oxford, Miss. at 1730; Arrive at Meridian, Miss. at 1809  
Depart from Meridian, Miss. at 1830; Arrive at Destin-Ft. Walton, Fla. at 1915  
Depart from Destin-Ft. Walton, Fla. at 1930; Arrive at Jackson at 2027  
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One of the four passengers is designated as the "primary passenger" on the Trip Information Sheet, which also lists the primary passenger's corporation as the customer. According to JAC and the primary passenger, the flights on the day of the accident were 14 CFR Part 91 flights. The Trip Sheet Information also provides a quote and list of charges.

The left front second row seat (#5) passenger stated that he had not flown in N363SE prior to the accident but has flown on similar airplanes with 8-12 seats but did not recall whether they were in Cessna 560 airplanes.

The right front seat (#4) passenger called the left front seat passenger and asked him to accompany him to Mayo Clinic to undergo medical tests. They both boarded the airplane at Gulfport, Mississippi, and flew to Destin, Florida, where the primary passenger boarded the airplane. They then flew to Meridian, Mississippi, where they dropped off the primary passenger. They then flew to Oxford, Mississippi, where they dropped off the primary passenger's wife.

The primary passenger stated that he boarded the airplane with his wife at Destin-Ft. Walton Beach, Destin, Florida, where he met his friend who was the #4 passenger and the other passenger who was the #5 passenger. They departed a few minutes after 0715 en route to Key Field Airport, Meridian, Mississippi, where the primary passenger deplaned and his wife continued onto University-Oxford, Oxford, Mississippi, where she then deplaned. The primary passenger stated that his wife overheard the pilots saying that they were going to top off the fuel and the remaining passengers could get some coffee or something to eat.

The #5 passenger stated that he had lunch with the right seat pilot (viewed looking forward from within the airplane). The right seat pilot was a "great guy" and was alert. During lunch, the right seat pilot ate a biscuit and drank a nonalcoholic beverage, but the left front seat passenger could not recall if it was coffee. The right seat pilot was a "young good looking healthy guy." The left seat pilot remained with the airplane. He stated that it was a "beautiful day" on the coast.

The #5 passenger stated that the crew obtained fuel for the airplane in University-Oxford, Oxford, Mississippi (a credit card receipt for 527 gallons of Jet A time stamp with a time stamp of 0846 at University-Oxford, Oxford, Mississippi, was found at the accident site). He stated that the cockpit door was left open during the flight and they did not talk to the flight crew because the noise level was "loud," and they were "far" from the flight crew.

According to Flight Service Station information, an IFR flight plan for N636SE was filed for a flight from UOX to RST at flight level (FL) 380 with no alternate airport.

The #5 passenger stated they were flying north toward Rochester, Minnesota, when they made a "hard u-turn" and started "dropping down" to Cresco, Iowa. He stated that it was a "pretty aggressive drop," and the descent was "more aggressive" than a "commercial airliner." He said he had "no fears what so ever." The descent was so steep that he could see the runway through the pilot windshield at an altitude of 5,000 feet. The airplane then felt as if it got "jarred" and a couple of overhead panels opened. The flight crew recovered and lined themselves up for landing. He stated alarms were "going on," and he heard a "beeping" and "pull-up pull-up." He stated that it looked like the flight crew was going to make a "picture perfect" landing.

The cockpit voice recorder (CVR) was read out by the National Transportation Safety Board's Recorders Laboratory. The CVR begins as the airplane is on final approach to University-Oxford airport in Oxford, Mississippi. The crew states the items in the landing checklist and the sound of touchdown, followed by in an increased background noise (similar to thrust reverser) is recorded. The CVR stops recording followed immediately by the sound of a CVR power-up tone. It is unknown how much local time actually elapsed between the shut down and power up of the CVR. However, eight minutes and thirty-two seconds elapsed from the beginning of the recording to the shut down/power-up of the CVR.

The second part of the recording began at the power-up tone on the CVR at 09:09:20 (approximately 8 minutes, 32 seconds after the start of the recording). About 09:11:54, the crew discusses the weather between Oxford, Mississippi, and Rochester, Minnesota. The crew states items in the before taxi and the before takeoff checklists and about 09:17:52, the right seat pilot states within the crew briefing that he will be flying the airplane. About 09:18:36, the sound of increased engine RPM is recorded. The airplane is issued an IFR clearance, as filed, from Memphis Center about 09:21:58. The airplane is subsequently issued clearance to climb to FL 380 and about 09:47:31, the airplane is transferred to Kansas City Center, where they are

given clearance to climb to FL 400. About 10:20:00, the airplane is transferred to Chicago Center and about 11 minutes later reports light chop. About 10:32:19, the airplane is transferred to another Chicago Center controller.

At 10:33:14, the crew requests a lower altitude, which the center controller approves to FL 350. About 10:42:33, the airplane is transferred to Minneapolis Center. About 10:43:13, the left seat pilot relays to Minneapolis Center that they are deviating from weather (but direct to Rochester), and additionally are not able to pick up automatic terminal information service (ATIS) at Rochester. The controller then relays the weather information to the airplane. About 10:45:54, the left seat pilot radios Center stating, "we're just gonna' keep kinda' heading this direction stay on the west side of the weather 'til we get north of Rochester and then turn around and take a look at it." The controller asks for clarification that he means "on the east side of the weather" and the left seat pilot replies, "affirmative." After, the airplane is transferred to another Minneapolis Center controller, the controller states at 10:51:57, "it's heck of a bow hook we got going on there... but ah you'd have to go about a hundred miles or more north to get around the very northern edge of it. Ah if you go around the south side um it's about eighty miles to get around the south side." The crew discusses it and decides to "pick [their] way through it."

About 10:54:54, the airplane is continuing its descent and is transferred to Rochester Approach. Approximately 8 seconds later, a partial ATIS recording for Rochester is recorded on the crew channels. At 10:55:26, the left seat pilot checks in with the Rochester Approach descending from 14,700 feet to 10,000 feet with ATIS information Victor. At 10:55:42, Rochester Approach states, "Citation six three six Sierra Echo Rochester approach and expect vectors for the ah loca- well wind three four zero at six gusts two four that would favor the I-L-S to three one but right now the area of weather that we've got is all along that final and we're showing weather echoes along that final approach course. say your intentions" The left seat pilot replies that they will continue for another 20 miles on their present heading of 240 degrees and "take a look at it on the radar."

10:56:25, the right seat pilot states, "probably what I'm going to do is go here to this hole then work my way up around that way."

10:56:27, the left seat pilot states, "yep yeah."

10:56:32, Rochester Approach clears the clears the airplane to descend and maintain 9,000 feet which the left seat pilot acknowledges.

10:57:00, the left seat pilot states, "so we're just going through the localizer right right now... about you have to go up and come back."

10:57:22, the left seat pilot states "yeah that's the only hole this is what he was talking about for the final yeah."

10:57:28, ATIS, "...Rochester Tower information Victor one five three eight Zulu special observation wind three two zero at two niner gusts three niner visibility one half thunderstorm heavy rain \*\*."

10:57:43, the right seat pilot states, "(teah) couldn't get there at a worse time."

10:58:01, the left seat pilot states, "I'm wondering if that hole's (blinking) if that red's (blinking) that spot (out right there)."

10:58:04, the right seat pilot states, "yeah yeah I'm curious about that too."  
10:58:07, the right seat pilot states, "we're gonna know here in a minute I'm gonna go this way."  
10:58:10, the left seat pilot transmits, "and Sierra Echo we're gonna turn a little bit further to the south, " and Rochester Approach acknowledges the transmission.  
10:58:20, the left seat pilot states, "this little airport right here C-C-J-J."  
10:58:33, the left seat pilot states, "don't see it on the map here."  
10:58:49, the right seat pilot states, "what airport is that?"  
10:58:51, the left seat pilot states, "uhh I'm gonna have to look it up heeere... C-C-J-J."  
10:59:18, [sound of tone similar to altitude alerter]  
10:59:19, the right seat pilot states, "I've got that airport right there."  
10:59:22, the left seat pilot states, "yep ah."  
10:59:31, the left seat pilot states, "how long's the runway look?"  
10:59:32, the right seat pilot states, "ah I'm guessing five thousand feet at least."  
10:59:44, the left seat pilot transmits, "yeah the airport below us to the left has got an identifier of Charlie Juliet Juliet what's what's that airport" to which Rochester Approach responds by stating that it "Cresco Iowa Cresco."  
10:59:58, the right seat pilot states, "I guess worse case scenario we could set here until it clears."  
11:00:00, the left seat pilot states, "yeah."  
11:00:04, the right seat pilot states, "what do you think?"  
11:00:05, the left seat pilot states, "Cresco yeah I mean I'm okay with that."  
11:00:06, the right seat pilot states, "let's do that."  
11:00:10, [sound of tone similar to autopilot disconnect]  
11:00:11, the left seat pilot states, "...ah we're just gonna land at Cresco and l-l-look at the weather on the ground and ah."  
11:00:15, RST approach transmits, "attention all aircraft Rochester information Whiskey's current altimeter three zero one zero."  
11:00:21, the left seat pilot states, "he's got you at nine you're going through nine."  
11:00:23, the right seat pilot states, "oh I'm sorry."  
11:00:25, the right seat pilot states, "ah I'm trying to stay below this weather and tell him we want to get down here."  
11:00:28, the left seat pilot transmitted to RST approach that they were going to land at Cresco, had the it in sight, and were subsequently cleared from the visual approach to CJJ.  
11:00:43, the right seat pilot states, "see if you can get me s-see if you can get me some numbers for the thing at all or well the landing numbers would be okay."

11:00:49, the right seat pilot states, "I'm gonna have to put us down here hang on."

11:00:54, the left seat pilot transmits to Rochester Approach and asks if they had the common traffic advisory frequency for Cresco to which the controller responds that he doesn't.

11:01:03, the right seat pilot states, "you didn't find it in the book at all?"

11:01:04, the left seat pilot states, "do what?"

11:01:05, the right seat pilot states, "even in the Ac-u-kwik?"

11:01:09, the left seat pilot states, "let's see."

11:01:16, the left seat pilot states, "crit-."

11:01:19, the left seat pilot transmits, "is it Cres-ton Iowa?"

11:01:26, [sound of clunk]

11:01:28, [sound of increased background noise]

11:01:35, RST Approach transmits, "and Citation six Sierra Echo that common traffic advisory frequency at Cresco one two two point eight" to which the left seat pilot replied with "...thank you."

11:01:47, [sound of tone similar to altitude alert]

11:01:48, the right seat pilot states, "whenever I slow down to flap speed I'll let you just go ahead and give them to me."

11:01:59, the left seat pilot states, "we're probably five miles south."

11:02:01, RST Approach states, "Citation six Sierra Echo report canceling the I-F-R." The left seat pilot responds by canceling the IFR clearance. Approximately 24 seconds later, the left seat pilot issued a traffic advisory, "ah Creston Iowa traffic Citation six three six Sierra Echo we're checking in for a we're turning final landing to the ah north."

11:02:35, the right seat pilot states, "whatever runway it is. [sound of laughing]

11:02:35, the right seat pilot states, "yeah."

11:02:38, the left seat pilot states, "improvise."

11:02:38, the right seat pilot states, "flaps land."

11:02:04, the right seat pilot states, "okay how we looking for landing got ignition got gear got flaps and speed brake still out."

11:02:45, the left seat pilot states, "\*\*\*crew brief\*\*\*."

11:02:49, the right seat pilot states, "don't let me land with the speed brake."

11:02:50, the left seat pilot states, "passenger advisory \* safe passenger\*."

11:02:52, the left seat pilot states, "fuel crossfeed antiskid is checked and on ground idle switch is coming to normal."

11:02:56, the right seat pilot states, "okay."

11:02:57, the left seat pilot states, "pressurization is down."

11:02:58, the right seat pilot states, "speed brake up please."



11:02:59, the left seat pilot states, "flaps \*\*is checked."

11:03:03, the left seat pilot states, "annd engine sync is off a-approach. Before landing landing gear verify down and three green."

11:03:08, the right seat pilot states, "checked."

11:03:09, the right seat pilot states, "great."

11:03:09, the left seat pilot states, "landing lights on. Ignition?"

11:03:11, the right seat pilot states, "they're up."

11:03:11, the left seat pilot states, "normal or on?"

11:03:12, (flaps).

11:03:12, GPWS, "terrain. terrain. [male synthetic voice]" followed by "pull up [male synthetic voice] two seconds later.

11:03:15, the right seat pilot states, "get rid of that guy or one of those guys." Over the next five seconds there were additional "pull up" statements by the GPWS.

11:03:24, the left seat pilot states, "all right you're in good shape \*\*\*."

11:03:24, the copilot states, "I don't see anything."

11:03:26, the left seat pilot states, "I don't either."

11:03:26, GPWS, "pull up... pull up. [male synthetic voice] and continued until the end of the recording.

11:03:28, the left seat pilot states, "and it's a wet runway too so."

11:03:30, the right seat pilot states, 'kay."

11:03:35, the left seat pilot states, "looks like it's long enough for you?"

1103:35, the right seat pilot states, "it's the descent rate."

1103:36, GPWS, "pull up. [male synthetic voice]"

1103:36, right seat pilot states, "yeah yeah."

1103:38, the left seat pilot states, "pretty short and wet be ready."

1103:38, the right seat pilot states, "yes it is."

1103:41, the right seat pilot states, "speed brake on touch."

1103:45, [sound of click]

1103:46, the left seat pilot states, "all right."

1103:46, [sound of two thumps]

1103:46, the left seat pilot states, "I'd go full reverse. You got a hundred and ten knots."

1103:47, [sound of click] followed by the [sound of two clicks]

1103:50, [sound similar to decreasing background noise]

1103:51, the left seat pilot states, "go around. go around."

1103:52, the left seat pilot states, "go go."

1103:53, the right seat pilot states, "full power. full power."

1103:58, [sound of decreased background noise]

1104:00, [sound similar to impact]

A witness, who was driving along Highway 9 at the time of the accident, stated that he noticed an airplane with its landing lights on approaching the airport from the southeast. He stated that he thought it "seemed odd with the wind from the south that he would land from that side." The witness stated that he continued to watch the plane and noticed that it was "way down the runway." The witness lost sight of the airplane behind an object but was "expecting to see the plane pull up and go around for another landing." When he saw the airplane again, he stated that it he saw it "crash into the south ditch and shoot up and over the road." He witnessed the plane "hit" on the other side of the road and called 911 to report the crash.

A second witness, who was driving east on Highway 9, stated that he "saw a plane look like it was going to land, but then [he] thought it was going too fast." He saw the airplane depart the end of the runway, cross the road, and come to rest on the other side.

A third witness stated that he was at his office near the airport where he was watching radar on his computer. He then went outside to watch the approaching storm. He saw the airplane approach from the southeast, descending "quite fast." He watched the airplane go past the airport hangars and corn adjacent to the runway and thought "they are going very fast." He stated that it was sprinkling a little and there was a very dark bank of clouds to the west and northwest. Some lightening was present. It struck him odd that it was a jet that was landing.

## PERSONNEL INFORMATION

### Left Seat Pilot Information

The left seat pilot was hired as a full-time pilot by JAC on June 5, 2006, and was planned but had not completed company 14 CFR Part 135 training and checking. He returned to JAC as a pilot after being employed as a pilot in a corporate flight department from 2005-2006.

He was issued an airline transport pilot certificate with an airplane multiengine land rating on September 24, 2005, that included commercial privileges for single-engine land airplanes. The left seat pilot held CE-500, G-1159, HS-125, and CE-560XL type ratings.

On August 3, 2005, the left seat pilot was issued a second-class airman medical certificate with the restriction: "holder shall wear lenses that correct for distant vision & possess glasses that correct for near vision". On the left seat pilot's application for the medical certificate, he listed 10,350 total hours of flight time and 350 hours in the past six months. According to the JAC's accident report, the left seat pilot had logged 11,607 hours of total flight time, with 557 hours in the accident make and model. The left seat pilot had logged 540 hours in the previous 12 months, 128 hours in the previous 90 days, and 9 hours in the previous 30 days.

On September 5, 2005, the left seat pilot was issued a notice of disapproval for failure of the flight portion of an examination for the initial issuance of a Cessna 560 XL type after having completed Flight Safety International training in Orlando, Florida.

On September 24, 2005, the left seat pilot satisfactorily completed the Cessna 560 XL training at Flight Safety International in Orlando, Florida, and passed his reexamination for the

issuance of a Cessna 560 XL type rating.

A pilot who had flown with the left seat pilot for approximately the past 3 and one-half years stated that he was an "excellent" pilot that was "safety conscience." He said that when you flew with the left seat pilot, you would fly as a team. The left seat pilot was "not one to sit back and would say something if he was uncomfortable." The left seat pilot would not just say, "let do this" and if he changed plans, he would ensure the "you're with him."

The only crew resource management that the left seat pilot received was with through Flight Safety. He stated that the left seat pilot would always fly the airplane and maintain situational awareness. The pilot exemplified that if you were flying with the left seat pilot, the left seat pilot would say something like "how about looking in AC-U-KWIK." The left seat pilot liked to use the AC-U-KWIK to obtain airport information.

The left seat pilot had no FAA record of previous accidents, incidents, or enforcement actions.

#### Right Seat Pilot Information

The right seat pilot was hired by JAC as a part-time pilot on January 18, 2005, and later began full-time employment on February 1, 2005. He was also the 14 CFR Part 135 chief pilot for the company. Prior to his employment with JAC, he was employed as a pilot at the same a corporate flight department that the right seat pilot was employed at. The right seat pilot had previously been employed as a pilot in 14 CFR Part 121 air carrier operations.

He was issued an airline transport pilot certificate with an airplane multiengine land rating on November 23, 2005, that included commercial pilot privileges for single-engine land airplanes and gliders. The right seat pilot held A-320, B-737, CE-500, CE-650, DA-50, and BE-300 type ratings. The right seat pilot was also issued a flight instructor certificate on March 1, 2006, with single-engine, multiengine, and instrument airplane ratings.

On June 21, 2006, the right seat pilot was issued a first class airman medical certificate with no restrictions. On the right seat pilot's application for the medical certificate, he listed 13,000 total hours of flight time and 120 hours for the past six months. According to JAC records, the right seat pilot had logged 13,312 total hours of flight time, with 833 hours in the accident make and model. The right seat pilot had logged 160 hours in the previous six months, 57 hours in the previous 90 days, and 14 hours in the previous 30 days.

On July 18, 2006, and December 16, 2006, the right seat pilot satisfactorily completed his last 14 CFR Parts 135.293, 135.297, 135.299 Airmen Competency/Proficiency checks for a BE-300 and CE-560 airplanes. All elements of the checks were listed as satisfactory, including judgment and crew coordination. Inspectors from the Jackson Mississippi Flight Standards District Office performed all of the right seat pilot's initial and recurrent checks.

A JAC pilot stated that the right seat pilot was "good guy" who was a "real professional." He stated that the "right seat pilot was open to criticism" and he would listen to anything you would say and was "easy" to work with. The right seat pilot wasn't "assertive" and you flew and thought things out as a crew when you flew with him.

The right seat pilot had no FAA record of previous accidents, incidents, or enforcement actions.

#### AIRCRAFT INFORMATION

The airplane was a 2003 Cessna 560 (Encore), serial number 560-0636, airplane that was listed on JAC's 14 CFR Part 135 operating certificate. The airplane was registered to Tomco II,

LLC and was under a lease agreement with the "principal passenger's" corporation until its sale to the corporation, which had a closing date of July 19, 2006. Following the closing, the airplane was to continue being managed by Jackson Air Charter, Inc.

The Cessna 560 is a large, twin engine, transport category, turbojet airplane. The airplane was configured to seat two flight crew and seven passengers. The aircraft's type-certificate data sheet lists the maximum takeoff weight as being 16,630 lbs and the maximum landing weight as 15,200 lbs.

The accident airplane was issued a normal airworthiness certificate on January 14, 2003. The accident airplane was maintained on an approved Manufacturer's Inspection Program. The last inspection was completed on April 11, 2006, at a total service time of 672 hours. The airframe had a total time of 713.3 hours at the time of the accident.

The airplane was equipped with two Pratt & Whitney Canada PW535A engines, serial numbers DC0202 and DC0203. The PW535A is a turbofan engine capable of producing 3,400 lbs of thrust.

The airplane was equipped with a Honeywell Primus 88 weather radar with weather detection capability, turbulence detection, target alert, and ground mapping capabilities.

#### METEOROLOGICAL INFORMATION

The National Weather Service (NWS) Area Forecast (FA) for the region was issued at 0630 and was valid until 1700. The synopsis section of the forecast predicted strong to possible severe thunderstorms over the upper Mississippi Valley and the Great Lakes region during the period. The forecast for east central and southeastern Minnesota was for scattered clouds at 3,000 feet, ceilings broken at 15,000 feet with tops to 25,000 feet. From 1000 to 1200 scattered thunderstorms and moderate rain with possible severe thunderstorms were forecast and cumulonimbus cloud tops were forecast above 45,000 feet. The forecast for eastern Iowa was for scattered to broken clouds at 4,000 feet with tops to 6,000 feet and visibility three to five miles in mist. From 0900 the forecast was for scattered clouds at 12,000 feet with scattered cirrus above.

The NWS Weather Depiction Chart for 1100 depicted an area of instrument flight rule (IFR) conditions over a portion of central Iowa. Surrounding that area was an area of marginal visual flight rule (MVFR) conditions over portions of eastern Minnesota, eastern Iowa, northern Missouri, southwestern Wisconsin, and western Illinois. The closest visual flight rule (VFR) conditions were depicted to the southwest over Iowa and to the northeast over Wisconsin.

The NWS Radar Summary Chart for 1119 depicted no weather echoes over the route until the flight reached central Iowa, where defined areas of echoes were identified. The chart depicted an area of intense to extreme weather echoes over central and northeastern Iowa, into southern Minnesota, that was identified with thunderstorms and rain showers. Severe thunderstorm watch number (Weather Watch) 616 was depicted extending over northeastern Iowa, southeast Minnesota, into southwestern Wisconsin, and over the accident site. The echo tops over eastern Iowa and Minnesota were depicted to 56,000 feet, with cells moving southeastward from 19 to 32 knots.

The regional radar mosaic at 1101 depicted two areas of organized echoes, one over northeastern Iowa and the second over southeastern Minnesota into western Wisconsin. Both systems merged in the general vicinity of the accident site and appeared as a bowing line with

an intense leading edge.

The NWS Storm Prediction Centers (SPC) Convective Outlook chart issued for 0721 depicted where the NWS expected the greatest potential for the development of organized severe thunderstorms. The chart depicted a moderate risk of severe thunderstorms over Iowa, northern Illinois, and southern Wisconsin, and extended over the accident site.

The next Convective Outlook update was issued after the accident at 1126. The bulletin continued to forecast a moderate risk of severe thunderstorms during the afternoon and evening hours across northern Iowa, extreme southern Minnesota, southern Wisconsin, and northern Illinois.

Convective SIGMET 34C was issued at 1055 and was valid until 1255 for portions of northeastern Iowa, southeastern Minnesota, and western Wisconsin. The air traffic control transcript indicated that the flight crew of N636SE was on frequency with Rochester approach control when the controller broadcast the hazardous weather information relating to Convective SIGMET 34C. The controller advised users to turn to the nearest Hazardous In-flight Weather Advisory Service (HIWAS) or Flight Service Station (FSS) for further information on the advisory. Convective SIGMET 34C described an area of severe thunderstorms moving from 300 degrees at 45 knots with tops above 45,000 feet. Hail up to 1 inch in diameter and wind gusts up to 70 knots were possible.

The closest weather reporting facility to the accident site was from Fillmore County Airport (FKA) in Preston, Minnesota, located approximately 19 nautical miles (nm) north of the accident site. The airport was equipped with an Automated Weather Observation System (AWOS-3) and reported the following weather conditions near the time of the accident:

FKA weather observation at 1035: wind 040 degrees at 4 knots; visibility 7 statute miles (sm) with thunderstorms in the vicinity; scattered clouds at 1,400 feet, ceiling broken at 2,600 feet, broken at 3,800 feet; temperature 22 degrees Celsius (C); dew point 21 degrees C; altimeter 30.00 inches of Mercury (Hg). Remarks: automated observation system; lightning distant all quadrants.

FKA weather observation at 1055: wind 030 degrees at 8 knots; visibility 7 sm in thunderstorms and light rain; ceiling broken at 1,600 feet, overcast at 2,600 feet; temperature 21 degrees C; dew point 20 degrees C; altimeter setting 30.05 inches of Hg. Remarks: automated observation system; lightning distant all quadrants.

FKA weather observation at 1135: wind 030 degrees at 7 knots; visibility 2 miles in thunderstorms and heavy rain; scattered clouds at 400 feet, ceiling broken at 1,000 feet, overcast at 1,400 feet; temperature 18 degrees C; dew point 18 degrees C; altimeter 30.12 inches of Hg. Remarks: automated observation system; surface visibility 1 1/4 sm variable 5 sm; hourly precipitation 0.95 inches; lightning distant all quadrants.

The next closest weather reporting station to the accident site was from Decorah Municipal Airport (DEH), located in Decorah, Iowa, 19 nm east of the accident site. The airport also had an AWOS-3 system, however it is unknown if a lightning detection system was incorporated with that system to be able to report thunderstorm activity. The AWOS-3 at DEH reported the following weather conditions near the time of the accident:

DEH weather observation at 1055: wind 180 degrees at 10 knots gusting to 15 knots; visibility 4 sm in light rain; ceiling broken at 1,300 feet, overcast at 5,500 feet; temperature 23 degrees C;

dew point 19 degrees C; altimeter setting 30.04 inches of Hg. Remarks: automated observation system

DEH weather observation at 1115: wind calm; visibility 2 sm in moderate rain; ceiling broken at 1,700 feet, broken at 3,400 feet, overcast at 5,500 feet; temperature 21 degrees C; dew point 17 degrees C; altimeter setting 30.00 inches of Hg. Remarks: automated observation system; hourly precipitation 0.01 inches.

DEH weather observation at 1135: wind 340 degrees at 12 knots gusting to 17 knots; visibility 10 sm in light rain; scattered clouds at 2,100 feet, scattered at 7,000 feet, ceiling broken at 10,000 feet; temperature 21 degrees C; dew point 17 degrees C; altimeter setting 30.11 inches of Hg. Remarks: automated observations system; hourly precipitation 0.01 inches.

RST, the airplane's intended destination, was located approximately 34 nm northwest of the accident site. The airport has an Automated Surface Observation System (ASOS) and is augmented by certified NWS weather observers. The following conditions were reported at RST:

RST special weather observation at 1038: wind 330 degrees at 29 knots gusting to 39 knots; visibility 1/2 sm in thunderstorms, light rain, and squall; few clouds at 100 feet, ceiling broken at 2,500 feet, broken at 4,400 feet; temperature 20 degrees C; dew point 17 degrees C; altimeter setting 30.11 inches of Hg. Remarks: automated observation system; peak wind from 330 degrees at 39 knots at 1038; surface visibility 2 sm; rain began at 0959; thunderstorm west moving east; lightning in cloud and cloud to ground; hourly precipitation 0.05 inches.

RST special weather observation at 1046: wind 320 degrees at 15 knots gusting to 39 knots; visibility 1/2 sm in thunderstorms, heavy rain, and fog; ceiling broken at 100 feet, broken at 2,500 feet; temperature 19 degrees C; dew point 18 degrees C; altimeter setting 30.11 inches of Hg. Remarks: automated observation system; peak wind from 330 degrees at 39 knots at 1038; wind shift at 1030; rain began at 0959; thunderstorm west moving east; lightning in cloud and cloud to ground; precipitation since last report 0.37 inches.

RST weather observation at 1054: wind 340 degrees at 10 knots gusting to 21 knots; visibility 1/2 sm in thunderstorms, heavy rain, and mist; ceiling broken at 100 feet, overcast at 2,500 feet; temperature 18 degrees C; dew point 18 degrees C; altimeter setting 30.11 inches of Hg. Remarks: automated observation system; peak wind from 330 degrees at 39 knots at 1038; wind shift at 1030; surface visibility 3/4 sm; rain began at 0959; sea level pressure 1019.1 hectopascals (hPa); thunderstorm west moving east; lightning in cloud and cloud to ground; hourly precipitation 0.78 inches; temperature 18.3 degrees C; dew point 17.8 degrees C.

RST special weather observation at 1140: wind 160 degrees at 7 knots; visibility 6 sm in thunderstorms, light rain, and mist; scattered clouds at 100 feet, ceiling broken at 5,500 feet, broken at 9,000 feet; temperature 18 degrees C; dew point 18 degrees C; altimeter setting 30.06 inches of Hg. Remarks: automated observation system; hourly precipitation 0.49 inches.

#### AIRPORT INFORMATION

CJJ has a single runway 15-33, which is 2,949 feet long by 50 feet wide and is made of concrete. The runway is equipped with low intensity runway edge lights. Runway 15 is aligned on a 152-degree heading and is equipped with a 2-box visual approach slope indicator (VASI) near the left side of the runway. Runway 33 is aligned on a 332-degree heading and is equipped with a 2-box VASI near the left side of the runway. The airport has 3 non-precision approaches:

GPS RWY 15, GPS RWY 33, and NDB RWY 33.

The airport had a wind indicator on the left side of runway 33 and a windsock on top of a row of hangars located on the east side of the airport. The airport does not have any weather reporting capability and instrument approach charts state to use the DEH altimeter setting.

#### FLIGHT RECORDERS

The airplane was equipped with an L-3 Communications model FA2100 Cockpit Voice Recorder (CVR) with 2-hour recording capability. The CVR was sent to the National Transportation Safety Board's Vehicle Recorder Laboratory for readout where it was noted not having sustained any heat or structural damage, and the audio information was extracted from the recorder normally and without difficulty.

The 2-hour portion of the CVR recording, each channel, the cockpit area microphone and mixed crew channel, contained excellent quality audio information. A partial transcript was established using the time of the accident.

The airplane was not equipped, nor was it required to be, with a Flight Data Recorder.

#### WRECKAGE AND IMPACT INFORMATION

The main airplane wreckage was located in a cornfield at 43 degrees 22.322 minutes north latitude, 92 degrees 08.241 minutes west longitude. The main wreckage was upright and oriented on a tail to nose heading of approximately 305 degrees.

Three equally spaced ground scars, consistent with both main and nose gear tires, were observed beginning at the departure end of runway 33. The left and center ground scars terminated before the right ground scar, which continued to the east-west oriented Highway 9. The highway was located approximately 1,105 feet from the departure end of runway 33. Portions of the inboard left and right flaps were located just north of the highway. There were no further ground scars located until a second area of ground scarring, which was located approximately 431 feet beyond the highway.

The second ground scar contained a 215-foot long debris path. The debris path, which contained sections of the nose of the airplane and cockpit avionics, was oriented on a 348-degree heading. The main wreckage was located at the end of the debris path.

The main wreckage consisted of the fuselage, empennage, both wings, both engines, and portions of the cockpit. The cockpit section was partially separated from the main fuselage near the main cabin door, was crushed downward, and was oriented on a northerly heading. Both throttles were found in the full power setting, the flap handle and indicator were found in the first takeoff setting, and the gear selector was found in the "down" setting.

The main cabin and fuselage remained mostly intact. The bottom of the fuselage showed damage from vertical crushing. Both wings remained connected to the fuselage. A tree trunk was embedded in the left wing near the wing root. The rear section of the fuselage was deformed in a downward direction in relation to the forward fuselage. The empennage and both engines remained attached to the rear fuselage.

Control continuity was established from the respective flight control surfaces to the cockpit area. All cable separations exhibited features consistent with overload. The elevator trim tab on the elevator was found in the nose up position, and the flap actuators were found in their takeoff position. The cockpit flap selector handle was in the "T.O. 200 KIAS" position. The

speed brakes were stowed.

Leading edge nicks and gouges were noted on the engines' fan blades. The trust reversers were stowed.

No pre-existing anomalies were found with the airframe and engines that would have prevented the normal operation of the airplane.

The Hobbs meter indicated 713.3 hours.

The following charts/publications were found at the accident site:

(a) AC-U-KWIK AIRPORT/FBO DIRECTORY with N636SE annotated on the front cover

(b) The Aviation Topographic Atlas, 2006-2007

(c) IFR Enroute Low and High Altitude Charts

(d) IFR Instrument Approach Charts

#### MEDICAL AND PATHOLOGICAL INFORMATION

##### Left Seat Pilot

The Iowa Office of the State Medical Examiner, Ankeny, Iowa, conducted an autopsy of pilot and listed the cause of death as blunt force injuries of the head and chest.

The FAA Civil Aeromedical Institute's Final Forensic Toxicology Accident Report for the left seat pilot was negative for all substances tested.

##### Right Seat Pilot

The Iowa Office of the State Medical Examiner, Ankeny, Iowa, conducted an autopsy of right seat pilot and listed the cause of death as blunt force injuries of the head and chest.

The FAA Civil Aeromedical Institute's Final Forensic Toxicology Accident Report for the right seat pilot reported the presence of carisoprodol, meprobamate, and chlorpheniramine in post-mortem samples. In medicine bottles labeled with the right seat pilot's name was found Soma (carisoprodol), Mepergan Fortis (meperidine/promethazine), hydrocodone/acetaminophen, tramadol, Advil (ibuprofen), Zantec (ranitidine), Prilosec (omeprazole), Tavist-D (clemastine/phenylpropanolamine), acetaminophen, and diphenhydramine.

Carisoprodol is a prescription muscle relaxant with sedative side effects. It has been widely reported to have abuse potential. Meprobamate is an active metabolite of carisoprodol. The level of meprobamate in the blood suggests the use of a typical dose of carisoprodol within the previous 12 hours or less. Single doses of carisoprodol have not been shown to impair performance, but chronic administration may well result in significant central nervous system depression, particularly in combination with other medications.

Chlorpheniramine is an over-the-counter sedating antihistamine commonly used for cold and allergy symptoms. In typical doses, the medication had measurable adverse effects on performance of complex cognitive and motor tasks. The medication was not detected in the blood, suggesting the right seat pilot was not impaired by its effects at the time of the accident.

The right seat pilot's most recent application for his first class airman medical indicated that he marked "no" for "Do you currently use any medication," for all items under "Medical History," and for "Visits to Health Professional in the Last 3 Years." According to right seat pilot medical



records, the right seat pilot had visited a general surgery clinic three times since May of 2004, with minor surgical procedures taking place during two of those visits. One visit occurred on the same day as his most recent application for a medical certificate.

The right seat pilot's wife stated that the right seat pilot would "off and on" have problems with his lower back. Most of the time he would receive medical treatment from his father. He received a prescription for his lower back in May around Memorial Day. She stated that if he had lower back problems, he would not fly. The pilot's father noted that his son had to "watch what he did" because of intermittent back pain. The pilot's father indicated the his son would not do heavy lifting because of his back pain. The pilot's father stated that his son was "very careful" regarding the use of medications that were not permitted while flying.

There were a total of six medicine bottles that were found with personal items belonging to the right seat pilot. Of the six bottles, three had the right seat pilot's name and the right seat pilot father's name as the prescribing doctor for two prescriptions of tramadol and one prescription for carisoprodol. One bottle had the right seat pilot's wife's name without the right seat pilot's father's name on the bottle. The labels of two bottles were unreadable. The pilot's father denied prescribing narcotics or muscle relaxants to his son, and stated that he would have recommended use of over-the counter medications for his son's back pain.

JAC had a random drug testing program as required by 49 CFR Part 40 for their 14 CFR Part 135 operations but not required for 14 CFR Part 91 operation of which the pilot was limited to. Title 49 CFR Part 40.85 states that the following five drugs or classes of drugs in a Department of Transportation drug test are:

- (a) Marijuana metabolites.
- (b) Cocaine metabolites.
- (c) Amphetamines.
- (d) Opiate metabolites.
- (e) Phencyclidine.

On December 28, 2004, the right seat pilot received a pre-employment drug test by JAC and the results of which were negative for the substance tested as required by 14 CFR Part 40. Following that test, he had not been selected for testing as part of the company's random drug testing program as required by 14 CFR Part 135 operations, which the right seat pilot was a part of.

#### SURVIVAL ASPECTS

The airplane nose structure was broken open exposing the crew compartment. The left seat pilot and right seat pilot seats were separated from the airframe with portions of the underlying airplane structure attached to both seats. The left seat pilot's restraint system was intact. The right seat pilot's restraint system was intact except for the lower harness, which was separated at the buckle latch. The latch was fractured through and possessed a fracture surface that was granular. First responders reported that the right seat pilot was not located in his seat.

A first responder stated that he was unable to open the emergency exit door using by using the exterior latch so he then attempted to break the emergency exit window using his flashlight. The first responder later reported that he did not realize the strength of the window on a large aircraft.

First responders extricated both passengers via the main cabin entry door, which was separated from the fuselage. The fuselage separated along the rear cabin entry fuselage frame exposing the cabin.

The #5 passenger, who sustained serious injuries, stated that he and the other passenger were wearing their seat belts but not their shoulder harnesses. The passenger stated that he did not use the shoulder harness because they don't use them in the major airlines. He stated that he was never shown where or how to operate the normal and emergency exits, when and how to fasten the seat belt and shoulder harness. They were never told to fasten their belts, except for the approach to Cresco, Iowa. The crew never mentioned the shoulder harness. He also stated that he did not see or know where the passenger briefing cards were at in the N636SE.

The "primary passenger" stated that all passengers received a briefing from the right seat pilot after he boarded the airplane and met the two other passengers.

The left front seat pan, "#5," was crushed along its right side and into the underlying seat frame. The right front seat, "#4," seat pan did not display any crushing. Both seat were attached to the respective seat rails, which were attached to the underlying aircraft structure. The restraint systems of both seats were intact. The Cessna 560 seats' g-tolerance is rated at 26 g's while previous models of Cessna 500 series airplane are rated at 23 g's.

#### TESTS AND RESEARCH

The Cessna Aircraft Company Product Safety Department computed landing distance calculations for the accident airplane using a landing weight of 13,500 lbs. On a dry runway at Vref with a 10 knot tailwind, the airplane would require approximately 3,150 feet to stop. On a wet runway at Vref with a 10 knot tailwind, the airplane would require approximately 4,284 feet to stop. At Vref + 10 knots on a wet runway, the airplane would require approximately 5,200 feet to stop. However, the Flight Manual for the accident aircraft states the following:

The published limiting maximum tailwind component for this airplane is 10 knots: however, Cessna does not recommend landings on precipitation-covered runways with any tailwind component.

#### Enhanced Ground Proximity Warning System (EGPWS)

The accident airplane was equipped with a Honeywell EGPWS. The EGPWS is a terrain awareness and alerting system that provides terrain alerting and display functions. The EGPWS uses aircraft inputs including attitude, altitude, airspeed, and glideslope deviation along with internal terrain, obstacle, and airport databases to predict a potential conflict between the aircraft flight path and terrain or an obstacle. If a conflict results, the EGPWS provides a visual and audio caution or warning alert. The EGPWS internal database includes a worldwide airport database containing information on runways 3,500 feet or longer in length. CJJ and its 2,949-foot runway were not contained in the EGPWS database.

The EGPWS system was sent to Honeywell for data extraction. The EGPWS data indicated that three audible warnings were given to the pilots during the approach to CJJ. The first warning, "Terrain Terrain Pull-up" was given at an altitude of approximately 2,000 feet mean sea level (MSL) about 1.2 nm from runway 33 at CJJ. The second warning, "Sink Rate," was given at approximately 1,650 feet MSL about 0.5 nm from the runway. The last warning given to the pilots by the EGPWS was "Sink Rate Pull-up," given at an altitude of approximately 1,550 feet MSL about 0.3 nm from the runway.

Mode 2A of the EGPWS provides alerts to help protect the aircraft from impacting the ground when rapidly rising terrain with respect to the aircraft is detected. Mode 2A is based on radio altitude and on how rapidly radio altitude is decreasing. The mode is active during climbout, cruise, and initial approach. If the aircraft penetrates the Mode 2A caution envelope, the aural message "Terrain Terrain" is generated and cockpit EGPWS caution lights will illuminate. If the aircraft continues to penetrate the envelope, the EGPWS warning lights will illuminate and the aural warning message "Pull-up" is repeated continuously until the warning envelope is exited.

Mode 1 of the EGPWS provides alerts for excessive descent rates with respect to altitude AGL and is active for all phases of flight. Penetration of the outer boundary of the warning envelope activates the EGPWS caution lights and the "Sink Rate" alert annunciation. Penetration of the inner boundary of the envelope activates the EGPWS warning lights and changes the audio message to "Pull-up."

Recommended responses to EGPWS alerts are as follows:

For caution alerts ("Terrain Terrain" or "Sink Rate"):

1. Stop any descent and climb as necessary to eliminate the alert. Analyze all available instruments and information to determine best course of action
2. Advise ATC of situation as necessary

For warning alerts ("Pull-up"):

1. Aggressively position throttles for maximum rated thrust. Apply maximum available power as determined by emergency need. The pilot not flying (if applicable) should set power and ensure that TO/GA [takeoff/go-around] power and modes are set.
2. If engaged, disengage the autopilot and smoothly but aggressively increase pitch toward "stick shaker" or Pitch Limit Indicators (PLI) to obtain maximum climb performance.
3. Continue climbing until the warning is eliminated and safe flight is assured.
4. Advise ATC of situation.

Flight Management System (FMS)

The accident airplane was also equipped with a Universal Avionics Systems Corporation FMS. The FMS manufacturer extracted data from the unit. The FMS data indicated that it had lost power at 11:03:39 on July 19, 2006. The FMS position was 43 degrees 22.54 minutes N latitude 92 degrees 08.23 minutes W longitude. The barometric altitude was 1,145 feet, the ground track was 341 degrees true, the true airspeed was 99 knots, and the ground speed was 106 knots. The takeoff timer indicated that the airplane had been airborne for seven seconds. The flight plan was programmed as UOX to RST; however, the crew had performed a "direct-to" RST approximately 7.7 nm north of UOX. CJJ was not programmed into the flight plan.

CJJ was included in the airplane's Flight Management System (FMS) "WORLD WIDE 2000 FT" database. The database contained runways 2,000 feet or more in length. The database contained runway information for runway 15-33 and the three instrument approaches to the airport.

Charts and Publications

The following statements within the AC-U-KWIK are made:

Although the AC-U-KWIK AIRPORT/FBO DIRECTORY is very accurate, it is intended for pre-flight planning purposes only and does not comply with FAA regulations governing publication for en route navigation.

AC-U-KWIK AIRPORT/FBO DIRECTORY contains information on public airports in the United States, Canada and Mexico with at least 3,000 feet of hard-surfaced runway.

The Aviation Topographic Atlas, 2006-2007, depicts CJJ as magenta colored circle denoting hard-surfaced runways 1,500-8069 feet in length. Beneath this symbol is the runway length of 2,900 feet denoted by "29". The circle does not have tick marks around the basic airport symbol denoting services-fuel available and field tended during normal working hours.

The IFR Enroute Low Altitude chart for CJJ depicts a runway length of 2,900 feet denoted by "29".

The IFR Instrument Approach Charts for CJJ depict runway 15-33 runway dimensions as 2,949 feet by 50 feet.

#### Company Information

JAC operated a total of four airplanes with one BE-300, one CE-501, and two CE 560 airplanes, inclusive of the accident airplane, that were listed on the company's operations specifications. The company employed a total of six pilots.

The company had no FAA record of previous accidents or incidents since issuance of its current 14 CFR Part 135 certificate on July 13, 1995.

#### Systems Safety

According to the Basic Guide to System Safety (Vincoli 1997), there are five basic steps listed in order of precedence for satisfying system safety requirements. These steps are listed as:

- (1) Design for minimum risk
- (2) Incorporate safety devices
- (3) Provide warning devices
- (4) Develop procedures and training
- (5) Risk acceptance

It further states under Develop Procedures and Training, "Where it is impractical to eliminate hazards through design selection or to adequately reduce the associated risk with safety warning devices, administrative controls, such as procedures and training, should be used to advise personnel how to operate the hazardous system

#### 14 CFR Part 91 and 135 Regulatory Information

14 CFR Part 91.103, Preflight Action, states, in part:

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include -

- (a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecast, fuel requirements, alternatives available if the planned flight cannot be completed,

and any known traffic delays of which the pilot in command has been advised by ATC.

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information

For civil aircraft for which an approved an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein

14 CFR Part 91.17, Alcohol or Drugs, states, in part:

(a) No person may act or attempt to act as a crewmember of a civil aircraft-

(2) While using any drug that affects the person's faculties in any way contrary to safety.

14 CFR Part 135.213(b), Weather Reports and Forecasts, states, in part:

For the purposes of paragraph (a) of this section, weather observations made and furnished to pilots to conduct IFR operations at an airport must be taken at the airport where those IFR operations are conducted, unless the administrator issues operations specifications allowing the use of weather observations taken at a location not at the airport where the IFR operations are conducted.

JAC operations specifications state, in part:

Co64. Terminal Area IFR Operations in Class G Airspace and at Airports Without an Operating Control Tower - Nonscheduled Passenger and All-Cargo Operations

a. The certificate holder is authorized to conduct these operations, provided that the certificate holder determines that:

(2) The airport has an approved source of weather or in accordance with the provisions for conducting the flight under the eligible on-demand authorization.

### 3.1.8 Approved Weather Sources

Whenever a weather report or forecast is required, the pilot shall use the National Weather Service, FSS, DUAT, AWOS-3, ASOS or a source approved by the NWS or the FAA administrator. To begin any IFR approach, the weather observation taken at the airport to be used must be reported by the National Weather Service or a source approved by the NWS or the FAA administrator, to be at or above the minimums prescribed for that approach.

FAR 135.387, Large Transport Category Airplanes: Turbine Engine Powered: Landing Limitations: Alternate Airports, states, in part:

(a) Except as provided in paragraph (b) of this section, no person may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless that airplane, at the weight expected at the time of arrival, can be brought to a full stop landing within 60 percent of the effective length of the runway for turbojet airplanes from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

(b) Eligible on-demand operators may select an airport as an alternate airport for a turbine engine powered large transport category airplane unless that airplane, at the weight expected at the time of arrival, can be brought to a full stop landing within 80 percent of the effective length of the runway from a point 50 feet above the intersection of the obstruction clearance plane and the runway.

14 CFR Part 135 commuter operators that conduct scheduled operations with aircraft requiring 2 pilots or that have 10 or more passenger seats must establish an FAA-approved crew resource management (CRM) training program for its pilots in accordance with 14 CFR Part 121, subparts N and O.

#### Aeronautical Decision Making/Crew Resource Management

Advisory Circular (AC) 60-22, "Aeronautical Decision Making" (ADM), applicable to airplane operations under 14 CFR Parts 61, 91, 121, 125, 133, 135, and 121, states that in 1987 six manuals oriented to the decision making needs of variously rated pilots were published. These manuals provide multifaceted materials designed to reduce the number of decision related accidents (the type of fatal general aviation pilot which accounts for 52 percent of fatal general aviation pilot error accidents). Pilots who had received ADM training made fewer in-flight errors than those who did not receive ADM training. The differences were statistically significant and ranged from 10-50 percent fewer judgment errors. In an operation environment, an operator flying about 400,000 hours annually demonstrated a 54 percent reduction in accident rate.

AC 60-22 also states under Operational Pitfalls, there are a number of classic behavioral traps into which pilots have been known to fall. Pilots, particularly those with considerable experience, as a rule always try to complete a flight as planned. One of these behavior patterns is "Mind Set," which is the inability to recognize and cope with changes in the situation different from those anticipated or planned.

AC 60-22 defines CRM in multiperson crew configurations as the effective use of all personnel and material assets available to the flight crew. CRM emphasizes good communication and other relationship skills. In 2004, AC 120-51E, Crew Resource Management Training, was issued. This AC states that investigations into the causes of air carrier accident have shown that human error is a contributing factor in 60-80 percent of all air carrier incidents and accidents. Many of the problems encountered by flight crews have very little to do with the technical aspects of operating in a multi-person cockpit. Instead, problems are associated with poor group decision-making, ineffective communication, inadequate leadership, and poor task or resource management.

The pilot who had flown with the accident right seat pilot stated that he became employed by JAC as a right seat pilot about 4-5 months prior to the accident. He stated that he completed company indoctrination and policy training with the accident right seat pilot as his instructor. Another company pilot also served as his flight instructor and 14 CFR Part 135 check airman. He stated that there was no specific and separate crew resource management (CRM) company training. The company CRM training was a part of flight training such as "running" checklists. He stated that he completed Citation Ultra 560 training, which is recommended by insurance. All the training received at Simuflight was at airports with 10,000-12,000 foot runways. He stated that during Simuflight training, there was no separate and specific CRM training but such training was incorporated into simulator training. He did not know what the minimum runway length what the minimum runway length database that was used in the FMS for simulator training. He stated that he "thinks" that N594M's FMS contains a minimum runway length database of 2,500 feet. He did not know the EGPWS contained a database of airports and that it would provide terrain annunciation for airports with runway lengths less than 3,500 feet. He stated the EGPWS manual was in the accident airplane and the other company Cessna 560 airplane.

Another pilot who had flown with the left seat pilot and began his employment as a pilot with JAC, approximately four years prior to the accident, stated that company flight crews practice flight briefings. He stated the "usually" the pilot-in-command will brief weather, route of flight, emergency procedures, instrument meteorological conditions and airplane weight. He stated the Cessna 560 XLS FMS has a minimum runway length database of 4,000 feet but he was uncertain of the value.

On June 13, 2002, the National Transportation Safety Board issued Safety Recommendation A-02-12, recommending to the FAA:

Revise 14 Code of Federal Regulations (CFR) Part 135 to require on-demand charter operators that conduct operation with aircraft requiring two or more pilots to establish a Federal Aviation Administration-approved crew resource management training program for their flight crews in accordance with 14 CFR Part 121, subparts N and O.

#### ADDITIONAL INFORMATION

The parties to the investigation included the FAA, Cessna Aircraft Company, Pratt & Whitney Canada, JAC, Honeywell, and Universal Avionics.

The aircraft wreckage and all retained materials were released and returned to the United States Aviation Underwriters claims manager.

#### Pilot Information

<b>Certificate:</b>	Airline Transport; Commercial	<b>Age:</b>	62, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land; Single-engine Sea	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>		<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>		<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2	<b>Last FAA Medical Exam:</b>	08/01/2005
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	09/01/2005
<b>Flight Time:</b>	11607 hours (Total, all aircraft), 557 hours (Total, this make and model)		

## Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Instructor; Commercial	<b>Age:</b>	41, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Glider	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Multi-engine; Airplane Single-engine	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1	<b>Last FAA Medical Exam:</b>	06/01/2006
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	06/01/2006
<b>Flight Time:</b>	14695 hours (Total, all aircraft), 833 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N636SE
<b>Model/Series:</b>	560	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	560-0636
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	9
<b>Date/Type of Last Inspection:</b>	04/01/2006, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>	41.3 Hours	<b>Engines:</b>	2 Turbo Fan
<b>Airframe Total Time:</b>	713.3 Hours at time of accident	<b>Engine Manufacturer:</b>	Pratt & Whitney Canada
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	PW535A
<b>Registered Owner:</b>	Tomco II, LLC	<b>Rated Power:</b>	3400 lbs
<b>Operator:</b>	G & S Holdings	<b>Operating Certificate(s) Held:</b>	None



## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	DEH, 1055 ft msl	Distance from Accident Site:	19 Nautical Miles
Observation Time:	1055 CDT	Direction from Accident Site:	90°
Lowest Cloud Condition:	Clear	Visibility	4 Miles
Lowest Ceiling:	Broken / 1300 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	10 knots / 15 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	180°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.04 inches Hg	Temperature/Dew Point:	23° C / 19° C
Precipitation and Obscuration:			
Departure Point:	OXFORD, MS (UOX)	Type of Flight Plan Filed:	IFR
Destination:	ROCHESTER, MN (RST)	Type of Clearance:	IFR
Departure Time:	0920 CDT	Type of Airspace:	

## Airport Information

Airport:	Ellen Church Field (CJJ)	Runway Surface Type:	Concrete
Airport Elevation:	1279 ft	Runway Surface Condition:	Wet
Runway Used:	33	IFR Approach:	Visual
Runway Length/Width:	2949 ft / 50 ft	VFR Approach/Landing:	Full Stop; Straight-in

## Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	2 Serious	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal, 2 Serious	Latitude, Longitude:	43.366111, -92.131111

## Administrative Information

Investigator In Charge (IIC):	Mitchell F Gallo	Report Date:	05/07/2008
Additional Participating Persons:	Joesph Quiring; Federal Aviation Administration; Des Moines, IA Steve Miller; Cessna Aircraft Company; Wichita, KS Paul Gipson; Honeywell Aerospace; Phoenix, AZ Brian Eckmann; Universal Avionics Systems Corporation; Redmond, WA		
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](#).