



National Transportation Safety Board Aviation Accident Final Report

Location:	Anchorage, AK	Accident Number:	ANC10FA048
Date & Time:	06/01/2010, 1705 AKD	Registration:	N59352
Aircraft:	CESSNA U206F	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	1 Fatal, 4 Serious
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

The commercial pilot and four passengers, three of whom were of the pilot's immediate family, were departing in a single-engine airplane on a personal cross-country flight to their lodge. The airplane was loaded with lumber, building materials, groceries, personal luggage, plants, and other items for the lodge. Two witnesses said that just before it took off the airplane was loaded so heavily that its tires looked almost flat.

The pilot reported to the NTSB that shortly after takeoff, at an estimated altitude of 150 feet, he raised the wing flaps from 30 degrees to 20 degrees, and the airplane began to sink. He said he started a slight right turn, but did not recall anything after that. According to multiple witnesses, the airplane was in an exaggerated nose-high, tail-low attitude, and struggling to climb as it approached the accident site. They related that the engine sounded loud, as if operating at full power, before it crashed into a parking lot and an unoccupied building.

A postimpact fire, and cargo in the cabin, slowed rescuers from quickly removing the victims. Four of the occupants survived with serious burns and other injuries; the pilot's 4-year-old son was killed.

The cargo remaining in the pod and cabin after the fire was weighed, and exemplar weights were used for the burned materials. Using conservative weights, which did not include some burned items like a large container of detergent, the airplane's total weight was estimated to be at least 658.2 pounds over its allowable gross weight, with a center of gravity significantly beyond the aft-most limit.

Both the aircraft and cargo pod manufacturer state maximum wing flap extension limits for takeoff; the aircraft manufacturer's pilot operating handbook notes 20 degrees should be the maximum, and the cargo pod manufacturer notes a maximum of 10 degrees. Selecting more flap extension than recommended induces additional aerodynamic drag and adversely affects

the airplane's acceleration and ability to climb.

Federal air regulations require that children 2 years of age or older must be secured with a lap belt. Both of the child passengers, age 2 and 4 years, were not secured with a lap belt and were sitting on the two other passenger's laps. During the crash sequence, the right front seat passenger was unable to hold onto the 4 year old. The child was pinned by the unsecured cargo and died in the fire.

Postaccident inspections of the airplane disclosed no preaccident mechanical anomalies that would have precluded normal operation.

The excessive overloading of the airplane, coupled with the aft center of gravity and the pilot's excessive use of flaps, placed the airplane well beyond its operating limitations, and made a successful takeoff highly improbable.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's decision to load the airplane well beyond its allowable weight and center of gravity limits, resulting in a loss of control during the initial climb. Contributing to the severity of the injuries was the pilot's decision to allow two child passengers to sit on other passenger's laps without restraints, and his failure to properly secure the cargo in the cabin. Also contributing was the pilot's excessive extension of the wing flaps.

Findings

Aircraft	Maximum weight - Capability exceeded (Cause)
Personnel issues	Weight/balance calculations - Pilot (Cause) Use of equip/system - Pilot (Factor) Decision making/judgment - Pilot (Cause)

Factual Information

HISTORY OF FLIGHT

On June 1, 2010, about 1705 Alaska daylight time, a Cessna U206F airplane, N59352, sustained substantial damage when it impacted an unoccupied building and terrain following a loss of control during the initial climb from runway 25 at the Merrill Field Airport, Anchorage, Alaska. A postcrash fire consumed much of the airplane. The airplane was being operated as a visual flight rules (VFR) cross-country personal flight under 14 Code of Federal Regulations (CFR) Part 91, when the accident occurred. The airplane was owned by Cavnar & Julian, Inc., Port Alsworth, Alaska. Of the five people on board, the commercial pilot/airplane owner and three passengers sustained serious injuries. The remaining passenger, the 4-year-old child of the pilot and the right front seat passenger, died at the scene. Visual meteorological conditions prevailed, and no flight plan was filed. The flight was en route to the airplane owner's lodge in Port Alsworth.

During on-scene interviews with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on June 1, witnesses reported that just after takeoff, the airplane was flying in a nose high, tail low attitude as it descended into the principally commercial area about 1/2 mile west of the Merrill Field Airport. One witness, who was also a pilot, commented that the airplane appeared to be "laboring" and possibly had an aft center of gravity or was very heavy. Another witness stated that the airplane was extremely nose high and tail low and was not climbing. The airplane was seen to enter a slight right turn, and then began to lose altitude before it crashed into an empty parking lot and adjacent unoccupied wood-framed single story building.

Shortly after impact, the airplane began to burn, which eventually spread to a portion of the building.

The crash site was adjacent to a major one-way north flowing roadway that serviced downtown Anchorage. Several witnesses and vehicle occupants went to the airplane to assist in removing the victims because of the imminent fire danger. Within a few minutes, law enforcement and fire department personnel arrived, put out the fire, and removed the remaining occupants.

During an interview with the pilot, he stated to the NTSB IIC that he recalled taking off and thinking that everything was okay. He remarked that he departed with 30 degrees of flaps which he said was standard for the Cessna 206. At 150 feet above the ground, he raised the flaps from 30 degrees to 20 degrees and detected "an issue" with the airplane. He said he was concerned about maintaining his airspeed and not stalling. He remembered initiating a slight right turn, and said he did not recall anything after that.

PERSONNEL INFORMATION

The pilot, age 33, held a commercial pilot certificate with airplane single engine land and sea ratings. He was issued a second class airman medical certificate without limitations on March 18, 2010.

The pilot's flight logbook was reviewed by the NTSB. The logbook covered the period from March 24, 2007, through May 26, 2010, and indicated that he had logged 1,717.9 hours total time and 81.1 hours in a Cessna 206, all of which were in the accident airplane. The time in the Cessna 206 was between March 20, and May 26, 2010. The pilot received instruction in the

Cessna 206 March 20 through 21, 2010. On March 21, 2010, he completed the requirements of a flight review, and received an endorsement for acting as pilot in command of a high performance airplane.

The NTSB IIC interviewed an aviation mechanic/pilot who had interacted and flown with the pilot. This individual stated he saw the pilot operate the airplane in what he believed was an overweight condition on four or five separate occasions. He said that this was over a 4 week period of time, and he did not know if this was standard. He also stated that he had not seen the pilot weigh any of the cargo or perform a weight and balance calculation during this period of time.

AIRCRAFT INFORMATION

The accident airplane (serial number U20603221) was manufactured in 1976 and had a standard airworthiness certificate for normal operations. A Teledyne Continental Motors IO-520-F engine rated at 285 horsepower at 2,700 rpm powered the airplane. The engine was equipped with a three-blade, McCauley propeller.

The airplane was maintained under an annual inspection program. A review of the maintenance records indicated that an annual inspection was completed on August 14, 2009, at an airframe total time of 6,888.2 hours and a tachometer time of 6,978.2 hours. On March 24, 2010, at a tachometer time of 6,998.5 hours, the landing gear floats were replaced with wheel landing gear. On April 19, 2010, at a tachometer time of 7,008.5 hours, a gravel deflector kit was installed.

An Aerocet cargo pack, supplemental type certificate (STC) SA00096SE was installed on the airplane. According to a mechanic who assisted the pilot, the cargo pack was installed during the week of April 26, 2010. The mechanic stated the owner told him that he would have his "IA" [inspection authorized mechanic] conduct the updated weight and balance calculation later. No maintenance log entry or updated weight and balance calculation for the cargo pack was discovered during the investigation.

According to Aerocet Incorporated, the cargo pack weighed 35 pounds, and for weight and balance calculations, had an arm at installation of 51.0 inches, and a resultant moment of 1,785.0 pound-inches. The weight capacity of the cargo pack was 300 pounds. Aerocet provided a flight manual supplement with the cargo pack, which noted general cargo pack information, the limitations, emergency procedures, normal procedures, and performance. Specifically, this supplement stated that no more than 10 degrees of flaps should be used for takeoff for operations at weights above 3,450 pounds due to the effect of the cargo pack on climb performance. This supplement was not located in the wreckage or in the pilot operating handbook located with the wreckage.

METEOROLOGICAL CONDITIONS

The closest official weather observation station was Merrill Field Airport (PAMR), Anchorage, Alaska, located 1/2 nautical mile (nm) east of the accident site. The elevation of the weather observation station was 137 feet mean sea level (msl). The routine aviation weather report (METAR) for PAMR, issued at 1653, reported, winds 200 degrees at 9 knots, visibility 10 miles, light rain, sky condition scattered at 4,000 feet, broken at 10,000 feet, temperature 15 degrees Celsius (C); dew point 7 degrees C; altimeter 29.48 inches.

WRECKAGE AND IMPACT INFORMATION

The accident site was in a parking lot adjacent to a single story, unoccupied building on the northwest corner of Ingra and 7th street in downtown Anchorage. The accident site was at an elevation of 111 feet msl and the airplane impacted on a magnetic heading of 270 degrees.

An on scene examination revealed an impact mark on the multi-story building across the street (to the east) from the main wreckage. The tail cone and tail spring of the accident airplane were found in the parking lot below this building. One power line was down adjacent to the multi-story building. The main wreckage of the airplane came to rest on a heading of west, with the right side of the airplane against a mound of earth and concrete. The main wreckage consisted of the burned remains of the right wing and fuselage, the empennage, the left wing, the engine and propeller assembly, and cargo.

The wreckage was recovered to a facility in Wasilla, Alaska, for further examination and documentation.

SURVIVAL ASPECTS

In an interview with the 16-year-old rear left seat passenger, she stated that the pilot was in the front left seat, the pilot's wife was in the front right seat, and the four-year-old passenger was unrestrained and seated on his mother's lap in the front right seat. The two-year-old passenger sat unrestrained on her lap in the rear left seat. The two-year-old was not sharing a seatbelt with her; he was just sitting on her lap.

Multiple witnesses to the accident came to the aid of the occupants of the accident airplane as it was burning. Photographs and witness descriptions depict several volunteers holding up the left wing while others worked to gain access to the occupants through the left forward exit. One rescuer reported that the airplane cabin was loaded from floor to ceiling, and they had to remove some of the cargo to reach the occupants.

The pilot was the first occupant pulled from the airplane, followed by the two-year-old passenger, who was handed out by the rear seat passenger. The rear seat passenger was rescued next, followed by the front right seat passenger.

The front right seat passenger was unable to hold onto the four-year-old passenger during the impact sequence. During the impact, the cargo shifted, and trapped the child between the cargo and the instrument panel. This prevented initial responders from reaching his location.

TESTS AND RESEARCH

On June 2, 2010, an investigator from the NTSB separated airplane wreckage and cargo recovered from the accident site. The occupant's packed clothing was laid out to dry, and food and grocery items were separated from the lumber and ceramic tile.

On June 3, 2010, the NTSB IIC, two aviation safety inspectors from the FAA, and investigators from Cessna Aircraft Company, and Teledyne Continental Motors examined the sorted wreckage.

The flight controls, including aileron cables, rudder cables, and elevator cables, were continuous except where they had been cut for transportation of the wreckage. Fuel screens were clean of contamination. The fuel selector valve was in the right fuel tank position. The elevator trim was set at 25 degrees tab up trim. The flap jack screw was measured to a position consistent with 25 degrees of flaps.

The finger screen on the engine driven fuel pump had contaminants across approximately 25 percent of the screen. The contaminants were permeable and were not a solid occlusion. The throttle control was partially open, the propeller control was at low pitch, and the mixture control was at idle cutoff. The spark plugs were clean. Further examination established continuity through the accessories, and valve train. Both magnetos produced spark when power was added.

All of the cargo items and lumber were weighed with a digital scale. See the section of this report titled "Additional Information" for the weight of each item from the accident wreckage. The cargo included a personal backpack full of medical equipment, a three-ring blow-up swimming pool, children's clothing, floor mats, clothes hangers, pots and pans, a tool bag, ceramic tile, a yellow survival kit, a car battery, wet wipes, a suitcase containing personal effects and adult clothing, a bag containing a lap top, a bean bag toss game, several plastic totes/containers, laundry detergent, several tubes of construction adhesive, 55 pieces of lumber, and food including spice mixes, seasoning, fruits, raw meat, canned goods, pasta, rice, creamer, frozen foods, and soda.

ADDITIONAL INFORMATION

Cessna Pilot's Operating Handbook

According to the Cessna Pilot's Operating Handbook (POH) for the Cessna U206F, Section 2 - Limitations – the maximum takeoff weight for the airplane was 3,600 pounds. The most forward center of gravity limit was 42.5 inches at 3,600 pounds and the most aft center of gravity limit was 49.7 inches. Section 4 – Normal Procedures – discussed the use of no more than 20 degrees of flaps for takeoff, both normal and maximum performance takeoff procedures.

Weight and Balance Calculations

The most recent weight and balance calculation for the airplane was documented on April 19, 2010. The empty weight of the airplane was calculated to be 2,165.5 pounds, resulting in a useful load of 1,434.5 pounds. As previously noted, this weight did not include the cargo pack.

The cargo was separated from the main wreckage on June 2, 2010, and allowed to dry. On June 3, 2010, the cargo was quantified and weighed. The following represents a conservative estimate of the weight of the cargo on the accident airplane. The weight of the lost fluid from the juice cans, laundry detergent, fruit, and other burnt items were not represented in this calculation.

55 pieces of lumber were documented:

43 pieces of 8 foot 2 x 4 – 9 pounds each – 387 pounds total

12 pieces of 8 foot 1 x 2.5 – 4 pounds each – 48 pounds total

The cargo, as listed previously in this report was sorted and weighed as follows:

Survival Kit – 15.2 pounds

Car Battery – 40.4 pounds

Tile – 333.1 pounds

Pots and Pans – 29.8 pounds

Food and Grocery Items – 173.4 pounds

Clothing – 72 pounds

Backpack – 16.2 pounds

Bag full of a mini pool and various items – 12 pounds

Tool Bag – 12.2 pounds

Laptop Backpack – 12 pounds

The pilot and passenger weights were documented using hospital medical records from their admission following the accident, in addition to the autopsy report for the fatality. The total occupant weight was 546.4 pounds.

The documented cargo, occupant weights, cargo pack, and estimated fuel load came to a total of 2,092.7 pounds. The gross weight of the airplane at the time of the accident was conservatively calculated to be 4,258.2 pounds or 658.2 pounds over the approved gross weight of the accident airplane. The exact location of each piece of cargo could not be determined. The center of gravity at the time of the accident was estimated to range between 53.65 inches and 58.522 inches, or between 3.95 and 8.82 inches aft of the rear-most allowable limit.

Title 14 CFR Part 91.9 required that the pilot comply with the operating limitation represented in the approved airplane flight manual. The FAA Pilot's Handbook of Aeronautical Knowledge, Chapter 9 – Weight and Balance, provided guidance for performing a weight and balance calculation; however, the FAA Pilot's Handbook of Aeronautical Knowledge did not provide guidance regarding the risk of estimating the weight of passengers and cargo as opposed to physically weighing the passengers and cargo. The handbook did state that it may not be "possible to fill all of the seats, baggage compartments, and fuel tanks and still remain within the approved weight and balance limits."

Cargo and Load Distribution

Multiple witnesses at Merrill field saw the pilot loading the airplane the day prior and the day of the accident flight. Several commented that the airplane was full and it was difficult to see where the passengers were sitting due to all of the cargo. Other witnesses reported that the tires were extremely low or flat, due to the excessive weight of the cargo on the airplane.

In an interview with the rear left seat passenger, she stated that lumber, food, tile, grout or mortar, and clothing were on the airplane. There was a "ton" of wood next to her seat. She estimated that there were 30 to 35 pieces of two by four lumber. The lumber was on the floor and some lumber was jutting up against the back of the front right seat, and some of the lumber extended forward between the front right and front left seats. There were also 10 to 15 boxes of ceramic tile on top of the wood. Several bins of food and her luggage were placed behind her in the rear of the airplane.

During an interview with the pilot, he stated that his estimation of the cargo, passengers, and fuel for the accident flight was 1,400 pounds to 1,450 pounds. He stated that all of the cargo weights were estimated, and not physically weighed. Specifically, he also stated that he had 360 pounds of fuel on board. The pilot said that he loaded one heavy item towards the front of the cargo pack, and lighter items towards the rear of the cargo pack. He put plants on top of the cargo in the cabin.

The pilot indicated that he did not use straps or a cargo net to secure the cargo in the cabin. He used twine or nylon to secure the tote and suit cases. He stated that the load was stable, and after he put the potted plants on top of the cargo, there was no room for shifting.

Federal Aviation Regulations

Part 91.107 (1) “No pilot may take off a U.S.-registered civil aircraft unless the pilot in command of that aircraft ensures that each person on board is briefed on how to fasten and unfasten that person’s safety belt and, if installed, shoulder harness...(3) Except as provided in this paragraph, each person on board a U.S.-registered civil aircraft must occupy an approved seat or berth with a safety belt and, if installed, shoulder harness, properly secured about him or her during movement on the surface, takeoff, and landing... Notwithstanding the preceding requirements of this paragraph, a person may: (i) Be held by an adult who is occupying an approved seat or berth provided that the person being held has not reached his or her second birthday and does not occupy or use any restraining device.

The FAA did not have a definition of adult as it pertains to this regulation. At the writing of this report, a definition or interpretation of adult has not been provided to the NTSB IIC.

FAA Hotline

The FAA has several avenues available to the public if they want to report their knowledge of an unsafe operation in the aviation community. This report can be done anonymously. The telephone numbers are 1-866-835-5322 (1-866-TELL-FAA) or 1-800-255-1111.

History of Flight

Prior to flight	Aircraft loading event
Initial climb	Loss of control in flight (Defining event)

Pilot Information

Certificate:	Commercial	Age:	33, Male
Airplane Rating(s):	Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 None	Last Medical Exam:	03/18/2010
Occupational Pilot:	No	Last Flight Review or Equivalent:	03/21/2010
Flight Time:	1718 hours (Total, all aircraft), 81 hours (Total, this make and model), 93 hours (Last 90 days, all aircraft), 67 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	CESSNA	Registration:	N59352
Model/Series:	U206F	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	U20603221
Landing Gear Type:	Tricycle	Seats:	3
Date/Type of Last Inspection:	08/14/2009, Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	6888 Hours	Engine Manufacturer:	CONT MOTOR
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-540-F
Registered Owner:	On file	Rated Power:	285 hp
Operator:	On file	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	PAMR, 137 ft msl	Observation Time:	1653 ADT
Distance from Accident Site:	1 Nautical Miles	Condition of Light:	Day
Direction from Accident Site:	90°	Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Scattered / 4000 ft agl	Temperature/Dew Point:	15° C / 7° C
Lowest Ceiling:	Broken / 10000 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	9 knots, 200°	Visibility (RVR):	
Altimeter Setting:	29.48 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	Light - Rain		
Departure Point:	Anchorage, AK (MRI)	Type of Flight Plan Filed:	None
Destination:	Port Alsworth, AK	Type of Clearance:	None
Departure Time:	1705 ADT	Type of Airspace:	

Airport Information

Airport:	Merrill Field (MRI)	Runway Surface Type:	
Airport Elevation:	137 ft	Runway Surface Condition:	
Runway Used:	N/A	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	1 Fatal, 3 Serious	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal, 4 Serious		

Administrative Information

Investigator In Charge (IIC): Jennifer Rodi **Adopted Date:** 03/16/2011

Additional Participating Persons: Richard R Ebert; Federal Aviation Administration FSDO; Anchorage, AK
Mike Koonce; Cessna Aircraft Company; Wichita, KS
Jason Lukasik; Teledyne Continental Motors; Mobile, AL
Anthony Bockelman; Federal Aviation Administration FSDO; Anchorage, AK

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Investigation Docket: <http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=76185>

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.