# National Transportation Safety Board

Washington, DC 20594

## Safety Recommendation

**Date:** August 21, 2015

**In reply refer to:** A-15-29

The Honorable Michael P. Huerta
Administrator
Federal Aviation Administration
Washington, DC 20591

The National Transportation Safety Board (NTSB) urges the Federal Aviation Administration (FAA) to take action on the safety recommendation issued in this letter. This recommendation addresses the current lack of a requirement for all 14 *Code of Federal Regulations* (CFR) Part 135 operators to prepare an accurate load manifest that contains all pertinent weight and balance information for each flight. The recommendation is derived from our investigation of the July 7, 2013, accident in Soldotna, Alaska, involving a single-engine de Havilland Canada DHC-3 Otter, which crashed shortly after takeoff due to the pilot's operation of the airplane outside of the weight and center of gravity (CG) limits contained in the airplane flight manual (AFM). As a result of this investigation, we have issued one safety recommendation to the FAA.

On July 7, 2013, about 1120 Alaska daylight time, a deHavilland DHC-3 Otter airplane, N93PC, collided with terrain shortly after takeoff from Soldotna Airport, Soldotna, Alaska. The commercial pilot and nine passengers were fatally injured, and the airplane was destroyed. The airplane was registered to Rediske Family Limited Partnership, Nikiski, Alaska, and was operated by Rediske Air, Nikiski, Alaska, under the provisions of 14 CFR Part 135 as an on-demand charter flight. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which was destined to Bear Mountain Lodge, about 90 miles southwest of Soldotna.[1]

The airplane's empty weight as documented in the aircraft inspection record was 4,283.09 lbs with a CG at 132.66 inches.[2] Before picking up the passengers, the pilot fueled and loaded the accident airplane at the operator's base with cargo (food and supplies). The operator

[1] More information about this accident, NTSB case number DCA13MA121, is available at http://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx.

[2] The NTSB recalculated the airplane's weight and balance based on data from paperwork, dated August 2010, documenting various modifications to the airplane. The airplane's empty weight as calculated by the NTSB was 4,288 lbs with a CG at 132.59 inches. See the Weight and Balance Study in the public docket for this accident for details of the NTSB's empty weight recalculations.

of the lodge where the passengers were headed estimated the cargo weighed about 300 pounds (lbs). The cargo was not weighed. The first leg of the trip from the operator's base to pick up the passengers was completed uneventfully.

Estimates of the passengers' weights were provided to the lodge operator in preparation for the trip, which totaled 1,350 lbs. The lodge operator estimated that the passengers' baggage weighed about 80 lbs. The load manifest indicated these weights for a total weight of 1,730 lbs but did not contain any balance data. The pilot did not document any weight and balance calculations nor was he required to do so. Additionally, weighing the cargo before loading it onto the airplane would have provided an accurate accounting of the cargo weight to be used in any CG calculation. The AFM indicated that the airplane's maximum gross weight was 8,000 lbs and the aft CG limit was 152.2 inches.

According to witnesses at the departure airport, after loading the passengers and their baggage, the pilot taxied for departure. There were no witnesses to the accident sequence. The airplane impacted the ground about 2,320 feet from the threshold of the departure runway and about 154 feet right of the runway centerline. An extensive postcrash fire consumed most of the airplane's cockpit and cabin area, including an unknown quantity of the baggage and cargo. Impact signatures were consistent with a nose-low and right-wing-low attitude at impact.

Using available data, the NTSB's investigation evaluated several scenarios to estimate the airplane's weight and balance for the first leg of the accident trip and for the accident flight. Based on this evaluation, the airplane was within weight and balance limitations for the first leg of the trip. Based on the closest estimate of the airplane's actual weight and balance once the passengers and baggage were loaded,[3] the cargo loaded was about 719 lbs, or about 2.4 times greater than the weight indicated on the load manifest. Thus, the airplane would have exceeded the maximum gross weight by about 21 lbs and the CG would have been at least 5.5 in aft of the limit. Further, a kinematics study of the accident flight found that with the pilot applying full pitch-down control input, the CG required to produce the motion observed in a video recovered from a passenger's smartphone (subject to some uncertainty) was significantly aft of the 152.2-inch aft limit for the accident flight (161 inches).

As an on-demand charter, the accident flight was subject to applicable regulations in 14 CFR Part 135 and the requirements set forth in the operator's operations specifications (OpSpec). As required by Section 135.399, the operator was not allowed to operate the accident airplane without complying with "the takeoff weight limitations in the Approved Flight Manual or equivalent." Neither Part 135 nor the operator's OpSpec requires the operator to physically document the weight and balance for any flights conducted in the company's single-engine airplanes. According to Section A096 of the OpSpec, when determining aircraft weight and balance, the operator should use either the actual measured weights for all passengers, baggage, and cargo or the solicited weights for passengers plus 10 lbs and actual measured weights for baggage and cargo. The NTSB's investigation found that the load manifest that was prepared for the accident flight was grossly inaccurate. The operator did not obtain actual weights for the cargo and passengers by weighing them or, alternately, adding 10 lbs to the estimated passenger weights and did not perform balance calculations.

[3] For more information, see the Weight and Balance Study in the public docket for this accident.

The NTSB determined that the probable cause of this accident was "the operator's failure to determine the actual cargo weight, leading to the loading and operation of the airplane outside of the weight and center of gravity limits contained in the airplane flight manual, which resulted in an aerodynamic stall. Contributing to the accident was the Federal Aviation Administration's failure to require weight and balance documentation for each flight in 14 *Code of Federal Regulations* Part 135 single-engine operations."

As cited in the probable cause, single-engine operations are excluded from the weight and balance documentation requirements of 14 CFR 135.63, which requires operators using multiengine aircraft to be "responsible for the preparation and accuracy of a load manifest in duplicate containing information concerning the loading of the aircraft." This load manifest must be prepared before each flight and include, among other items, the number of passengers, total weight of the loaded aircraft, the maximum allowable takeoff weight, and the CG location of the loaded aircraft. One copy of the load manifest should be carried in the airplane and the operator is required to keep the records for at least 30 days.

The NTSB previously addressed this safety issue when we issued Safety Recommendations A-89-135 and A-99-61. The earlier recommendation was issued following our investigation of a November 13, 1988, accident involving a Piper PA-28-181, N8342L, which crashed next to the intended landing runway during the pilot's attempted missed approach at Jacksonville International Airport, Jacksonville, Florida.[4] The pilot and all three passengers on board died. Although investigators were unable to determine the extent to which the airplane's weight and balance condition contributed to the accident, they found that the airplane exceeded its maximum allowable takeoff weight by 90 lbs and its aft CG limit by 0.5 in.

The letter that transmitted Safety Recommendation A-89-135 cited other accidents involving single-engine airplanes operated under Part 135 in which weight and/or CG were cited as a cause or contributing factor.[5] Safety Recommendation A-89-135 asked the FAA to "amend 14 CFR 135.63(c) to require operators of single-engine aircraft to comply with the requirements therein for preparation of a load manifest before each takeoff." The FAA ultimately disagreed with the recommended action and the NTSB classified the recommendation "Closed—Unacceptable Action" on July 2, 1990.

Safety Recommendation A-99-61 was issued following our investigation of an October 10, 1997, accident involving a Cessna 208B operated by the Department of the Interior, in which the pilot and all eight passengers on board died.[6] The probable cause of the accident was determined to be, in part, "the pilot's failure to maintain sufficient airspeed for undetermined reasons while maneuvering the airplane near maximum gross weight and aft CG in or near [instrument meteorological conditions], which resulted in a loss of control and entry into a stall/spin." Safety Recommendation A-99-61 asked the FAA to "amend the record-keeping

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[4] The report for this accident, NTSB case number MIA89FA033, is available at http://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx.

[5] The reports for the accidents cited in the A-89-135 recommendation letter, NTSB case numbers ANC73AA049, MIA77FA048, and ANC84FA116, are available at http://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx.

[6] The report for this accident, NTSB case number DCA98MA002, is available at http://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx.

requirements of 14 *Code of Federal Regulations* 135.63(c) to apply to single-engine as well as multiengine aircraft." Although the FAA's October 12, 2010, notice of proposed rulemaking for air ambulance and commercial helicopter operations and 14 CFR Part 135 aircraft operations proposed record-keeping requirements for single-engine and multi-engine aircraft, the final rule, published on February 21, 2014, did not include this requirement. As a result, Safety Recommendation A-99-61 was classified "Closed—Unacceptable Action" on September 11, 2014.

The NTSB's interest in this safety issue is longstanding and we continue to be concerned that single-engine 14 CFR Part 135 operations, such as the accident flight in Soldotna, remain outside the regulations that require weight and balance calculations to be documented before every flight. It seems likely that if the FAA had taken the recommended action in the 26 years since the NTSB first recommended it, the accident in Soldotna would have been prevented. Had the operator been required to prepare an accurate manifest for all flights that included evidence that the airplane was within approved CG limits using accurate values for the cargo weight, it would have been clear that the airplane was loaded beyond its operational limitations, and the flight from Soldotna should not have been performed with the cargo that was on the airplane. The NTSB concludes that the safety of single-engine 14 CFR Part 135 operations would be improved if they were subject to the same regulations concerning weight and balance documentation as multiengine 14 CFR Part 135 operations.

Therefore, the National Transportation Safety Board makes the following recommendation to the Federal Aviation Administration:

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> Expand the applicability of the recordkeeping requirements of 14 *Code of Federal Regulations* 135.63(c) to all Part 135 operations, including single-engine operations, to require (1) the preparation of an accurate load manifest containing evidence that aircraft are within the approved center of gravity limits for each flight, (2) the inclusion of a copy of the documentation on board aircraft for each flight, and (3) the preservation of a copy of the documentation for at least 30 days after the flight.

Chairman HART, Vice Chairman DINH-ZARR, and Members SUMWALT and WEENER concurred in this recommendation.

The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives. We would appreciate receiving a response from you within 90 days, as required by 49 *United States Code* section 1135, detailing the actions you have taken or intend to take to implement it. When replying, please refer to the safety recommendation by number and submit your response electronically to correspondence@ntsb.gov.

[Original Signed]

By: Christopher A. Hart,
Chairman