DON'T ASSUME 'APPROVED' NECESSARILY MEANS SAFE

The Air Midwest accident in 2003 shows that while weight guidelines are important, they are not hard and fast rules.

Michael R. Grüninger and Capt. Andreas Grauer report

Air Midwest Flight 5481 was a regularly scheduled passenger flight from Charlotte Douglas Intl. Airport (KCLT) to Greenville-Spartanburg International Airport (KGSP). On January 9th, 2003, it was a normal morning flight for the crew, which consisted of 25-year-old Captain Katie Leslie and 27-year-old First Officer Jonathan Gibbs. The Beechcraft 1900D was handed over to them by the preceding crew with the remarks that "everything was normal" and "it was a good flying airplane".

Prior to the flight, the crew had completed the load sheet and had accepted a "heavy" bag to be loaded in the aft cargo compartment as one of the passengers was a 12 years old child instead of an adult. The pre-flight controls check showed no abnormalities. At 08:46 local time, the tower controller cleared Flight 5481 for take-off. The captain was pilot flying on that sector and ordered take-off power to be set.

Ten seconds after rotation and after the landing gear had been retracted, the aircraft started to pitch-up through 20° nose-up. The unexpected nose up behavior of the aircraft surprised the captain. She experienced difficulties controlling pitch attitude and told the first officer to help her. Even together, the pilots could not push the aircraft's nose down.

Ten seconds later, the aircraft stalled with a pitch attitude of 54°, banked to the left and entered a steep dive. The crew desperately tried to recover from the upset situation and fought against the uncontrollability of the aircraft and for their lives for another fifteen seconds before the aircraft crashed into a maintenance hangar on the airfield.

All passengers and crew perished. The aircraft was destroyed by impact forces and the post-crash fire.

CATASTROPHE
The plane, operating as US Airways Express, crashed during takeoff.

Disturbing Investigation Results

The National Transportation Safety Board (NTSB) investigated the fatal accident, and found two major shortcomings that led to the disaster.

The first problem was related to maintenance issues. Two nights before the accident, the aircraft had undergone maintenance work at a repair facility in Huntington, West Virginia, which had included adjustments of the cables for elevator control. The mechanic who did the rigging had never worked on the Beechcraft 1900D before. He had incorrectly set the turnbuckles controlling the tension of the cables in a way that allowed only 7° pitch down instead of the correct 14°. As a result, elevator downward travel was limited, and thus was the pilot's possibility for nose-down commands. The work had been part of the mechanic's training, and no post adjustment check was conducted after the completion of the work. The airplane finally left the maintenance hangar with the elevator not being fully operational.

The NTSB noted that the Federal Aviation Administration (FAA) had been aware of serious deficiencies in training procedures at the repair facility but had done nothing about it.

The second problem was related to the company's mass and balance program. Air Midwest used standard passenger weights instead of actual weights to determine the take-off mass and the center of gravity (CG) for each flight. The "Aircraft Weight and Balance Control" guidance AC 120-27C issued by the FAA and in force at the time of the accident suggested to use 180 lbs for an adult passenger in the spring and summer and 185 lbs in the fall and winter, both weights including 20 lbs for carry-on baggage. The Air Midwest weight and balance program, which was approved by the FAA, used 170 lbs

for spring and summer and 175 lbs for fall and winter.

During the investigation, the NTSB found out that the actual average passenger weight on the accident flight was more than 20 lbs higher than the standard weights considered by the accident flight weight and balance calculation. Furthermore, a survey conducted by the NTSB among 22 operators showed that the average passenger weight for the observed flights was 196 lbs and average weight of the carry-on baggage was 16 lbs.

Thus, Flight 5481 was in fact 580 lbs too heavy, and its center of gravity was 5% aft of the allowable limit. Based on the too low standard weights, the pilots felt confident that the aircraft's weight was well below the maximum allowable take-off weight and the center of gravity within limitations.

The combined effect of reduced pitch down elevator control and excessive take-off mass and center of gravity position left the flight crew no chance. With the retraction of the landing gear the center of gravity moved backwards and further out of the approved envelope causing the airplane to pitch-up abruptly. As the investigation report states, at the time of the accident, the elevator did not allow any further nose-down command. The airplane was out of control. Recovery was impossible.

Approved Procedures and Data

In the aftermath of the accident, both the aviation industry and the FAA reacted. The problems related to the maintenance training and supervision that had contributed to the accident have been discussed extensively and measures have been taken by the FAA and the involved companies to prevent similar cases from happening again. The same applies for the standard weights used for M&B calculations and the instructions for crews and operations personnel for preparing load sheets.

An aspect that has received less attention is the psychological effect of authority approvals on airline personnel, both managerial and non-managerial. Standard weights are subject to approval by the authorities. Thus, such data is often not questioned anymore by responsible managers and operating staff after the approval has been granted. "We do not need to discuss this; the procedure has been approved by the authority and has been audited by it" is an answer that auditors often hear when they want to dig into safety critical issues.

Operational values prescribed by regulations usually state a baseline limit below which an operator cannot go. As the FAA guidance AC 120-27C states, the values given in it are not even regulatory, and standard weights used by an operator still must be based on data collected during actual operations. Despite this requirement, Air Midwest's weight and balance program and the weights that were 10 lbs below the limit given by AC 120-27C had been approved by the FAA.

The case illustrates that approved data is not challenged by either the responsible manager or the internal auditors just because it is approved by the authority, even when its incorrectness is apparent. If the company compliance monitoring and safety management system had insisted on a verification and validation of the used data, the fact that the values are not realistic would have surfaced and the accident could have perhaps been prevented.

Have Things Changed Since?

Now some may say the accident happened almost 20 years ago; things have changed to the better, and this cannot happen anymore. But it still can.

Today most European airlines work with standard passenger masses approved by the authorities. Concurrently, passengers often bring more luggage into the cabin than allowed. In fact, business travelers do not want to wait for the checked baggage to be delivered at the destination and therefore try to carry everything needed on the journey in their carry-on baggage. Low fare passengers want to avoid the surcharge for checked baggage, and therefore does the same. Traveler equipment websites even offer special coats for sale that have large internal pockets to be able to bring even more items on board without having to check them in. And yet, size and weight checks on carry-on baggage are only seldomly performed at the boarding gates.

Responsible airline managers and auditors monitoring their activities often simply rely on authority approvals without further questioning the basis for such approvals. Complacency, then, waits around the corner, and doubts are not expressed or considered anymore.

Don't Assume, Make Sure

While aviation managers might feel safe by confidently following authority approved procedures, at least the operator's internal quality assurance program should ask the critical questions. Does the approved procedure really make sense? Is it actually safe?

The operator remains ultimately accountable for the safety of its operation and the appropriateness, completeness and correctness of its operational procedures. Accountability cannot be delegated to the authority approving the operator's procedures and operations specifications.

Flight 5481 crashed because of the complacency of the most parties involved. Accepted standard weights for passengers and baggage were assumed to do the job of loading the airplane safely. Particularly on smaller aircraft, such as the Beech 1900, differences between assumed and actual weight increase the operational risks significantly. The same applies to differences between assumed and actual position of the center of gravity.

This accident shows that an operator should not take anything for granted just because it has been approved by an authority. For the sake of flight safety, don't assume "authority approved" necessarily means safe.

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