



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 27, 2017

Specialist's Report

OPERATIONAL FACTORS

ERA16FA215

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A. ACCIDENT

Operator: Aero National, Inc.
Location: State College, PA
Date: June 16, 2016
Time: 0830 EDT (eastern daylight time)
Airplane: PA 31-325, N3591P

B. AIR SAFETY INVESTIGATOR

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C. SUMMARY

On June 16, 2016, at 0830 EDT, a Piper PA-31-325, N3591P, was destroyed during collision with terrain while on approach to University Park Airport (UNV), State College, Pennsylvania. The airline transport pilot and passenger were fatally injured. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the on-demand air taxi flight, which was conducted under the provisions of 14 *Code of Federal Regulations* Part 135. The airplane departed Washington County Airport (AFJ), Washington, Pennsylvania, about 0800.

D. DETAILS OF THE INVESTIGATION

1.0 Interviews and Records Review

Interviews with the company owner, director of operations, and the company's primary PA- 31 flight instructor were conducted on July 13th, 2016, at the company headquarters located at AFJ.

Reviews of the accident pilot's training records and duty logs were conducted during the visit. A Performance Study was produced by the NTSB and reviewed by the operational factors specialist.¹

E. FACTUAL INFORMATION

1.0 Operational Factors

¹ The NTSB Performance Study for this accident is available in the public docket.

1.1 Stabilized Approach Concept

The Aero National General Operations Manual contains a section on the criteria for a stabilized approach and the action a pilot should take if an approach becomes un-stabilized. Two relevant pages are excerpted below in figures 1 and 2.

**AERO NATIONAL, INC.
GENERAL OPERATIONS MANUAL**

Page J-22
Revision 7
Date 12-18-2007

STABILIZED APPROACH CONCEPT

A stabilized approach is one that maintains a constant angle and constant rate of descent profile ending near the touchdown point where the landing maneuver begins.

Remember the fundamental key to flying a stabilized approach is the inter-relationship of pitch and power.

Procedure:

1. Complete landing check list prior to 1000 Ft. height above touchdown (HAT)
2. Flight is to be stabilized by 1000 Ft (HAT)
 - a. The airplane is to be in landing configuration.
 - b. The airplane is on track with the correct localizer, VOR radial or other track guidance that has been tuned, identified and being followed.
 - c. Aircraft is trimmed for and maintained approach speed.
 - d. Power is set to control rate of descent (No greater than 1000 Ft. Per Min.).
 - e. On approaches with no electronic vertical guidance, exercise special care in adjusting descent angle to cross fixes at the published altitude striving to maintain a constant angle, constant rate descent profile ending at the touchdown point.

Execute Missed Approach

1. If unexpected sustained rate of descent greater than 1000 Ft. Per Min. is encountered.
2. If maintaining correct track requires bank angles greater than 30 degrees
3. If excessive power changes are required or if rate of descent varies excessively.
4. If below 1000 Ft. (HAT) Leveling off at MDA or above is **not** recommended and a Missed approach should be executed.

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Figure 1: Aero National Inc. General Operations Manual page J-22

STABILIZED APPROACHES

In instrument weather conditions, a pilot must continuously assess instrument information throughout an approach to properly maneuver the aircraft (or monitor autopilot performance) and to decide on the proper course of action at the decision point (DH or MDA/MAP). Significant speed and configuration changes during an approach can seriously complicate tasks' associated with aircraft control, increase the difficulty of properly evaluating an approach as it progresses, and complicate the decision of the proper action to take at the decision point.

The handling and engine-response characteristics of most turbojet aircraft further complicate pilot tasks during approach and landing operations. A pilot must begin formulating a decision concerning the probable success of an approach before reaching the decision point.

The pilot's decision-making requires the pilot to be able to determine displacements from the course or glide-path centerline, to mentally project the aircraft's three-dimensional flight-path by referring to flight instruments, and to then apply control inputs as necessary to achieve and maintain the desired approach path. This process is simplified by maintaining a stable approach speed, descent rate, vertical flight-path, and configuration during the final stages of an approach. Maintaining a stable speed, descent rate, vertical flight-paths, and configuration is a procedure commonly referred to as the stabilized approach concept.

Operational experience has shown that the stabilized approach concept is essential for safe operations with turbojet aircraft, and it is strongly recommended for all other aircraft. Configuration changes at low altitude should be limited to those changes that can be easily accommodated without adversely affecting pilot workload. A stabilized approach for turbojet aircraft means that the aircraft must be in an approved landing configuration (including a circling configuration, if appropriate), must maintain the proper approach speed with the engines spooled-up, and must be established on the proper flight path before descending below the minimum "stabilized approach height" specified for the type of operation being conducted.

These conditions must be maintained throughout the rest of the approach for it to be considered a stabilized approach. Pilots of turbojet aircraft must use procedures that result in stabilized approaches. Pilots operating propeller-driven aircraft should also maintain a stable speed and flight-path on final approach.

A stabilized approach must be established before descending below the following minimum stabilized approach heights. 500 feet above the airport elevation during VFR or visual approaches and during straight-in instrument approaches in VFR weather conditions MDA or 500 feet above airport elevation, whichever is lower, if circling maneuver is to be conducted after completing an instrument approach 1000 feet above the airport or touchdown zone elevation during any straight-in instrument approach in instrument flight conditions.

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Figure 2: Aero National, Inc. General Operations Manual page C-27

As these two paragraphs state, a stabilized approach consists of several elements. The approach should be stabilized by 1,000 feet height above touchdown (HAT). In this accident, that would be an altitude of about 2,200 ft mean sea level (msl). The guidance from the above excerpts state that below this altitude, a descent rate of no greater than 1,000 feet per minute (fpm) should be used, and if an unexpected, sustained rate of descent greater than 1,000 fpm is encountered during the period when the approach should be stabilized, a missed approach should be performed. The guidance further states “Pilots operating propeller-driven aircraft should also maintain a stable speed and flight path on final approach.”

According to an NTSB Performance Study produced for this accident, the final radar return from the flight indicated an altitude of 2,500 msl (about 1,300 feet HAT), and the Study calculated a descent rate of 1,000 fpm at this point. It also calculated that about thirty seconds earlier, the descent rate had been 1,700 fpm. In the two minutes prior to the final radar location, the airplane had gone from a descent rate of 960 fpm (at 4,800 msl) to 300 fpm (at 4,300 msl) to 1,700 fpm (at 3,000 msl) and finally to 1,000 fpm (at 2,500 msl.) During this same two-minute period, the airspeed remained at 160 KCAS², (+/- 8 knots) for the first minute, then dropped rapidly, reaching 120 KCAS at the final radar point. According to the company director of operations, the desired approach speed was 120 KIAS (this is with the landing gear down and at the glideslope intercept point, normally the final approach fix.) At this airspeed, the descent rate necessary to maintain the 3° glideslope would have been about 637 fpm.

The performance study also concluded the pilot was above the glideslope at the final approach fix, and remained above it to the final radar location of 3.4 NM from the runway. See table 1 below.

Because the final radar data point for the plane occurred at an altitude of 2,500 msl (1,300 feet HAT), the Performance Study for this accident could not determine if the airplane met the company’s criteria for a stabilized approach, since that criteria is applicable from 1,000 feet HAT to landing. The Performance Study does indicate the airplane experienced rapid and significant changes in descent rate from outside the final approach fix to the final radar location. The study also concludes the airplane remained well above the desired approach speed and glideslope from the final approach fix to the final radar location, with airspeed decaying rapidly from 140 KCAS to 120 KCAS during the final 15 seconds of the radar track.

The table below, using data from the Performance Study, illustrates the airplane’s distance above the glideslope centerline, descent rate, altitude, and HAT at four distinct points during the approach.

² Knots Calibrated Airspeed. Under the conditions of this flight the KCAS would vary by only a few knots from the KIAS (Knots Indicated Airspeed), the airspeed read by the pilot on his airspeed indicator.

<i>Distance from runway</i>	<i>Point</i>	<i>Feet above glideslope center</i>	<i>Descent Rate</i>	<i>Altitude</i>	<i>HAT</i>
6.7 NM	Final Approach Fix	800	1,100 fpm	4,200 msl	3,000 ft
5.5 NM	Approach Outer Marker	500	1,500 fpm	3,500 msl	2,300 ft
4.5 NM	-	300	1,700 fpm	3,000 msl	1,800 ft
3.4 NM	Final radar location	200	1,000 fpm	2,500 msl	1,300 ft

Based on the glideslope's width in feet (top to bottom), the airplane would have been at or above the upper limit of the glideslope at the first three points, which would have resulted in a full-scale deflection of the pilot's glideslope indicator. The airplane would have been only slightly less than full-scale deflection at the final point of 3.4 NM from the runway.

During interviews at the company headquarters, both the company Director of Operations and the company President stated that at the outer marker, more than one dot (approximately one-quarter scale) of deflection of the glideslope indicator or variation more than 10 KIAS from the desired airspeed should lead to a pilot executing a missed approach.

1.2 Pilot Training

The company training records indicated the pilot had received the training required by the company's operations and training manuals. The pilot had completed the required annual ground training on January 18, 2016. His last airman competency check was conducted January 18, 2016 in the accident airplane. His next check was due in July 2016. The pilot was current and qualified in two company aircraft, the PA-31 Navajo and the CE-550 Citation Jet. The records showed no failures or retraining events for either his ground training or competency checks. No anomalies were observed in his training records. During the interviews, both his primary instructor and the company's Director of Operations (also a Federal Aviation Administration (FAA) designated check airman) made positive comments about the pilot's knowledge and flying skills. They said they knew of no other company pilots who questioned the accident pilot's flying skill. They said none of the company's pilots had requested not to fly with him.

1.3 Pilot Certificate and Medical Certificate

The pilot had a valid Airline Transport Pilot (ATP) certificate with a multiengine land rating issued July 10, 2013, and a first-class medical certificate issued March 7, 2016. The medical certificate had the limitation "Not valid for any class after 3/31/2017". See the NTSB Medical Review for more information.

1.4 Pilot Duty Records and Recent Flight Times

Pilot duty records indicated compliance with flight and duty time requirements of CFR 14 Part 135. The pilot had just returned from one week of vacation, and the accident flight was his first

flight since returning to duty. Company duty records indicated that in the previous 90 days, the pilot had flown 51 hours in the CE-550 Citation Jet, and 46 hours in the PA-31 Navajo. The pilot's most recent 5 duty periods prior to the accident involved flights flown in the PA-31 which totaled 25 hours of flight time.

2.0 Summary

The accident flight was considered short and routine, suitable for single-pilot operation.³ This route and this passenger were routinely flown by the accident pilot, according to the company owner.

From the final approach fix to the outer-marker, and then to the last location of the flight given by radar, the airplane's descent rate and airspeed were erratic, and it remained above the glideslope, at or near full-scale glideslope-indicator deflection. The airplane's performance during this period of the flight was not consistent with that required to meet the stabilized approach criteria by the 1,000 ft HAT point. Because the final radar position of the plane occurred before it descended below the 1,000 ft HAT point, it is not known if the pilot met the stabilized approach criteria as he descended below this point. It is also not known if the pilot attempted a go-around.

Based on company records review, interviews, and the NTSB's Air Traffic Control Review and Analysis of this accident, there is no indication the pilot violated any other company rules or procedures or FAA air traffic control instructions. There were no indications of non-compliance with part 135 regulations or with FAA-issued operational specifications on the part of the company or the accident pilot.

The three company personnel interviewed were familiar with the concept of a stabilized approach, as outlined in company training material. They were confident the accident pilot was trained and competent in conducting a stabilized approach, and stated that he had always flown stabilized approaches during their flights with the accident pilot.

Submitted by

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³ Aero National had been issued OpsSpec A015 by the FAA which allowed the use of a single pilot for IFR flights in airplanes equipped with an autopilot.