National Transportation Safety Board
Aviation Accident Final Report

Location:	Apache Junction, AZ	**Accident Number:**	WPR12MA046
Date & Time:	11/23/2011, 1831 MST	**Registration:**	N690SM
Aircraft:	ROCKWELL 690	**Aircraft Damage:**	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	6 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

Ponderosa Aviation, Inc. (PAI) purchased the airplane and relocated it from Indiana to PAI's base at Safford Regional Airport (SAD), Safford, Arizona, about 1 week before the accident. PAI's president conducted the relocation flight under a Federal Aviation Administration (FAA) ferry permit due to an unaccomplished required 150-hour inspection on the airplane. The airplane's arrival at SAD terminated the ferry permit, and no inspections were accomplished to render the airplane airworthy after its relocation. Although other airworthy airplanes were available, PAI's director of maintenance (DOM) (the accident pilot) and the director of operations (DO), who were co-owners of PAI along with the president, decided to use the nonairworthy airplane to conduct a personal flight from SAD to Falcon Field (FFZ), Mesa, Arizona, about 110 miles away. All available evidence indicates that the DOM was aware of the airplane's airworthiness status and that this was the first time he flew in the accident airplane. The DO flew the leg from SAD to FFZ under visual flight rules (VFR) in night visual meteorological conditions (VMC). After arriving at FFZ and in preparation for the flight back to SAD, the DOM moved to the left front seat to act as the pilot flying.

The airplane departed FFZ about 12 minutes after it arrived. The return flight was also conducted under VFR in night VMC. There was no moon, and the direction of flight was toward sparsely lit terrain. After takeoff, the air traffic control (ATC) tower controller instructed the pilot to maintain runway heading until advised due to an inbound aircraft. About 2 minutes later, the controller cleared the airplane for its requested right turn and then began a position relief briefing for the incoming controller. No subsequent communications to or from the airplane occurred, nor were any required. Radar data indicated that the airplane turned onto a course directly towards SAD and climbed to and leveled at an altitude of 4,500 feet. About 4 minutes after the right turn, while continuing on the same heading and ground track, the airplane impacted a mountain in a wings-level attitude at an elevation of about 4,500 feet.

Although the airplane was technically not airworthy due to the unaccomplished inspection, the investigation did not reveal any preimpact airframe, avionics, engine, or propeller discrepancies that would have precluded normal operation. Airplane performance derived

from radar tracking data did not suggest any mechanical abnormalities or problems.

FFZ, which has an elevation of 1,394 feet mean sea level (msl), is situated about 15 miles west-northwest of the impact mountain. The mountain is surrounded by sparsely lit terrain and rises to a maximum charted elevation of 5,057 feet msl. The investigation was unable to determine whether, or to what degree, the pilot conducted any preflight route and altitude planning. If such planning had been properly accomplished, it would have accounted for the mountain and provided for terrain clearance. The pilot had flown the round trip flight from SAD to FFZ several times and, most recently, had flown a trip from SAD to FFZ in night VMC 2 days before the accident. Thus, the pilot was familiar with the route and the surrounding terrain. According to the pilot's brother (PAI's president), the pilot typically used an iPad for navigation and flew using the ForeFlight software app with the "moving map" function. The software could display FAA VFR aeronautical charts (including FAA-published terrain depictions) and overlay airplane track and position data on the chart depiction. Although iPad remnants were found in the wreckage, the investigation was unable to determine whether the pilot adhered to his normal practice of using an iPad for the flight or, if so, what its relevant display settings (such as scale or terrain depiction) were. Had the pilot been using the ForeFlight app as he normally did, he could have been able to determine that the airplane would not clear the mountain on the given flight track.

According to the pilot's brother, the pilot typically departed an airport, identified the track needed to fly directly to his destination, and turned the airplane on that track. Radar tracking data from the accident flight indicated that the airplane began its turn on course to SAD about 2 miles northeast of FFZ. Comparison of the direct line track data from FFZ to SAD with the track starting about 2 miles northeast of FFZ direct to SAD revealed that while the direct line track from FFZ to SAD passed about 3 miles south of the impact mountain, the direct track from the point 2 miles northeast of FFZ to SAD overlaid the impact mountain location. Thus, the pilot likely set on a direct course for SAD even though the delayed right turn from FFZ put the airplane on a track that intersected the mountain. The pilot did not adjust his flight track to compensate for the delayed right turn to ensure clearance from the mountain.

In addition, a sector of the Phoenix Sky Harbor (PHX) Class B airspace with a 5,000-foot floor was adjacent to the mountain range, which reduced the vertical options available to the pilot if he elected to remain clear of that airspace. The pilot's decision to remain below the overlying Class B airspace placed the airplane at an altitude below the maximum elevation of the mountain. The pilot did not request VFR flight following or minimum safe altitude warning (MSAW) services. Had he requested VFR flight following services, he likely would have received safety alerts from ATC as defined in FAA Order 7110.65. Had he requested the MSAW in particular, he likely would have received an advisory that his aircraft was in unsafe proximity to terrain. Further, the investigation was unable to determine why the pilot did not request clearance to climb into the Class B airspace or fly a more southerly route that would have provided adequate terrain clearance. On the previous night VMC flight from FFZ to SAD, the pilot stayed below the Class B airspace but turned toward SAD right after departure. In response to issues raised by this accident, the FAA conducted a Performance Data Analysis Report System (PDARS) study to determine the legitimacy of a claim that it was difficult for VFR aircraft to be granted clearance to enter Class B airspace. The PDARS study revealed that on the day of the accident, 341 VFR aircraft were provided services by Phoenix TRACON. The

PDARS study, however, was unable to document how many aircraft were actually within the Class B airspace itself or how many had been refused services; the study only documented how many had been provided services. In response to a January 20, 2012, FAA internal memo formally restating the claim that it was difficult for VFR aircraft to obtain clearance into the PHX Class B airspace, the FAA conducted a comprehensive audit of the PHX Class B airspace that spanned four different time periods and was spread among several sectors during peak traffic periods to provide the most accurate picture. Of 619 requests for VFR aircraft to enter Class B airspace, 598 (96.61%) were granted. While data was not available to refute or substantiate any claims from previous years regarding difficulty obtaining clearance into the PHX Class B airspace, this data clearly indicated that difficulty obtaining clearance into the PHX Class B airspace did not exist during the four time periods in which the audit took place in the months after the accident.

The moonless night decreased the already low visual conspicuity of the mountain. The airplane was equipped with very high frequency omnirange and GPS navigation units, a radar altimeter, and an Avidyne EX-500 multifunction display. Had the pilot conducted the flight under instrument flight rules (IFR), the resultant handling by ATC would have helped ensure terrain clearance.

The airplane was not equipped with a terrain awareness and warning system (TAWS). Six years earlier, the accident airplane seating configuration was changed to reduce passenger seat provisions from six to five by removing a seat belt from the aft divan, which was originally configured with seat belts for three people. This modification rendered the airplane exempt from the TAWS requirement; however, this modification was not approved by the FAA or documented via a supplemental type certificate or FAA Form 337 (Major Repair and Modification). Per the requirements of 14 Code of Federal Regulations 91.223, TAWS is not required for airplanes with fewer than six passenger seats. In this accident, onboard TAWS equipment could have provided a timely alert to help the pilot avoid the mountain.

Based on the steady flight track; the dark night conditions; the minimal ground-based lighting; and the absence of preimpact airplane, engine, or propeller anomalies that would have affected the flight, the airplane was likely under the control of the pilot and was inadvertently flown into the mountain. This controlled flight into terrain (CFIT) accident was likely due to the pilot's complacency (because of his familiarity with the flight route and because he selected a direct route, as he had previously done, even though he turned toward the destination later than he normally did) and lack of situational awareness. In January 2008, the National Transportation Safety Board issued a safety alert titled "Controlled Flight Into Terrain in Visual Conditions: Nighttime Visual Flight Operations Are Resulting in Avoidable Accidents." The safety alert stated that recent investigations identified several accidents that involved CFIT by pilots operating under VFR at night in remote areas, that the pilots appeared unaware that the aircraft were in danger, and that increased altitude awareness and better preflight planning likely would have prevented the accidents. The safety alert suggested that pilots could avoid becoming involved in a similar accident by accomplishing several actions, including proper preflight planning, obtaining flight route terrain familiarization via sectional charts or other topographic references, maintaining awareness of visual limitations for operations in remote areas, following IFR practices until well above surrounding terrain, advising ATC and taking action to reach a safe altitude, and employing a GPS-based terrain awareness unit.

Member Sumwalt filed a concurring statement that can be found in the public docket for this accident. Member Weener joined the statement.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain a safe ground track and altitude combination for the moonless night visual flight rules flight, which resulted in controlled flight into terrain. Contributing to the accident were the pilot's complacency and lack of situational awareness and his failure to use air traffic control visual flight rules flight following or minimum safe altitude warning services. Also contributing to the accident was the airplane's lack of onboard terrain awareness and warning system equipment.

Member Sumwalt filed a concurring statement that can be found in the public docket for this accident. Member Weener joined the statement.

Findings

Aircraft	Altitude - Not attained/maintained (Cause)
	Ground proximity system - Not specified (Factor)
Personnel issues	Flight planning/navigation - Pilot (Cause)
	Complacency - Pilot (Factor)
	Situational awareness - Pilot (Factor)
	Use of available resources - Pilot (Factor)
Environmental issues	Dark - Contributed to outcome
	Mountainous/hilly terrain - Contributed to outcome

Factual Information

HISTORY OF FLIGHT

On November 23, 2011, about 1831 mountain standard time, a Rockwell International (Aero Commander) 690A airplane, N690SM, was destroyed when it impacted terrain in the Superstition Mountains near Apache Junction, Arizona. The commercial pilot and the five passengers were fatally injured. The airplane was registered to Ponderosa Aviation, Inc. (PAI) and operated by PAI under the provisions of 14 Code of Federal Regulations (CFR) Part 91 as a personal flight. Night visual meteorological conditions (VMC) prevailed, and no flight plan was filed. The airplane had departed Falcon Field (FFZ), Mesa, Arizona, about 1825 and was destined for Safford Regional Airport (SAD), Safford, Arizona.

PAI's director of maintenance (DOM) and the director of operations (DO), who were co owners of PAI along with the president, conducted a personal flight from SAD to FFZ. The DO flew the leg from SAD to FFZ under visual flight rules (VFR) in night VMC. After arriving at FFZ and in preparation for the flight back to SAD, the DOM moved to the left front seat to act as the pilot flying. The airplane departed FFZ about 12 minutes after it arrived. According to a witness, engine start and taxi-out appeared normal.

Review of the recorded communications between the pilot and the FFZ tower air traffic controllers revealed that when the pilot requested taxi clearance, he advised the ground controller that he was planning an "eastbound departure." The flight was cleared for takeoff on runway 4R, and the pilot was instructed to maintain runway heading until advised, due to an inbound aircraft. About 90 seconds later, when the airplane was about 1.1 miles from the departure end of the runway, the tower local controller issued a "right turn approved" advisory to the flight, which the pilot acknowledged. Radar data revealed that the airplane flew the runway heading for about 1.5 miles then began a right turn toward SAD and climbed through an altitude of about 2,600 feet mean sea level (msl). About 1828, after it momentarily climbed to an altitude of 4,700 feet, the airplane descended to an altitude of 4,500 feet, where it remained and tracked in an essentially straight line until it impacted the mountain. The last radar return was received at 1830:56 and was approximately coincident with the impact location. The impact location was near the top of a steep mountain that projected to over 5,000 feet msl. Witnesses reported seeing a fireball, and law enforcement helicopters were dispatched.

PERSONNEL INFORMATION

Pilot (General Information)

The pilot, age 31, held a commercial pilot certificate with ratings for single-engine and multiengine land and instrument airplane. He also held a mechanic certificate with ratings for airframe and powerplant. His Federal Aviation Administration (FAA) second class medical certificate was issued in July 2011. The pilot was a co-owner of PAI and was PAI's DOM.

The pilot's personal flight records contained entries until February 2011, at which time the pilot recorded that he had 1,151.9 hours in single-engine airplanes and 951.5 hours in multiengine airplanes. On his most recent FAA medical certificate application, the pilot reported a total flight experience of 2,500 hours.

The computerized PAI flight record (which began tracking 14 CFR Part 135 flights only in

February 2011) indicated that the pilot had 116.5 hours total flight experience, including 18 hours in night VMC. According to the records, during the preceding 90 and 30 days, the pilot had accumulated about 28.5 and 5.3 flight hours, respectively. The records showed that the pilot had flown 2 hours on two different flights in the week before the accident. The most recent flight was in night VMC from SAD to FFZ and back. Examination of the flight records revealed that the pilot had flown that round trip flight at least twice, in the previous 2 weeks.

Pilot Training

According to PAI and its FAA principal operations inspector (POI), employee pilots receive annual training over a 2- to 3-day period. The chief pilot organized most of the training, which consisted of regulation review, company policy, and actual flight training. The POI observed parts of the training. According to company training records, the pilot's most recent 14 CFR Part 135 competency/proficiency check was satisfactorily completed on September 24, 2011.

Pilot's 72-Hour History

According to the pilot's wife, in the 3 days before and including the accident day, the pilot awoke about 0630 and left for work about 0700. Two days before the accident, he flew to FFZ, arriving back at SAD about 2145.

Relatives of the pilot stated that nothing unusual had occurred in his life in the 72-hour period before the accident. His wife reported that the pilot did not take medications, aside from a hypothyroidism medication that he had reported to the FAA, and he did not have any physical conditions or ailments aside from the hypothyroidism.

MEDICAL AND PATHOLOGICAL INFORMATION

The Forensic Science Center in Tucson, Arizona, conducted an autopsy on the pilot; the cause of death was cited as blunt force trauma. The FAA Forensic Toxicology Research Team at the Civil Aviation Medical Institute performed toxicological testing of specimens collected during the autopsy. The results of the specimens were negative for carbon monoxide, cyanide, and listed drugs.

AIRPLANE INFORMATION

General

The airplane was manufactured in 1976 by Rockwell International, and the type certificate holder at the time of the accident was Twin Commander, LLC. The airplane was equipped with two Honeywell TPE-331-series turboshaft engines and two Hartzell three-blade propellers. Maintenance records indicated that the airframe had accumulated a total time in service of about 8,188 hours. The left engine had accumulated a total time since major overhaul of about 545 hours, and the right engine had accumulated a total time since major overhaul of about 1,482 hours.

The airplane was recently purchased by PAI and was flown about 1,200 miles from Indiana to the PAI facility at SAD about 1 week before the accident. It was certificated for single-pilot operation. At the time of the accident, the airplane was configured for a pilot (left side), a copilot (right side), and five passengers.

According to the sale advertisement listing for the airplane, the airplane was equipped with very high frequency omnirange (VOR) and GPS (KLN 90B) navigation units, a radar altimeter, and an Avidyne EX-500 multifunction display, which were destroyed in the accident.

Ferry Permit Information

At the time of purchase by PAI, the airplane was not in compliance with an FAA required 150-hour inspection requirement, and PAI requested an FAA ferry permit to fly the airplane from Eagle Creek Airpark (EYE), Indianapolis, Indiana, to the PAI facility in Safford, Arizona. On November 16, 2011, the FAA issued a ferry permit for the relocation of the airplane. The permit was valid until arrival at SAD or November 25, 2011, whichever came first. It only permitted a direct flight between EYE and SAD and only allowed the pilot and essential crew on board. The airplane was flown by the PAI president, who was the brother of the accident pilot, from EYE to SAD on November 17, 2011. The arrival at SAD terminated the ferry permit.

PAI and FAA Scottsdale Flight Standards District Office (FSDO) personnel estimated that it would normally require two people 2 days to conduct the inspection necessary to render the airplane in compliance with the outstanding airworthiness items, exclusive of correcting any identified deficiencies. All available evidence indicated that no maintenance activity was accomplished on the airplane between its arrival at SAD and its departure to FFZ on the night of the accident; the condition that warranted the ferry permit had not been corrected.

Terrain Awareness and Warning System (TAWS) Equipment Information

Title 14 CFR 91.223 stated that with certain exceptions, turbine-powered, US registered airplanes configured with six or more passenger seats and manufactured before early 2002 could not be operated after March 29, 2005, unless the airplane was equipped with an approved TAWS unit.

Since the accident airplane was manufactured in 1976 and was turbine-powered, any exclusion from the TAWS requirement required that the airplane had to be configured with five or fewer passenger seating positions. According to the type certificate holder's documentation, the airplane was manufactured and delivered with six passenger seating positions. Therefore, the airplane's as manufactured configuration required the installation of TAWS by March 2005. No records indicating that the number of passenger seating positions was ever less than six before May 2005 were located. However, a detailed review of airplane maintenance records, preaccident photographs, TAWS equipment manufacturer's data, and a detailed inventory of the recovered wreckage indicated that the accident airplane was never equipped with TAWS. (The sale advertisement information for the airplane indicated that it was equipped with a KGP-560 TAWS B unit.)

Maintenance documentation indicated that in May 2005, the airplane seating configuration was changed to reduce passenger seat provisions from six to five by removing a seat belt from the aft divan, which was originally configured with seat belts for three people. Per the requirements of 14 CFR 91.223 and the reduced passenger seat count, the airplane was not required to be equipped with TAWS.

However, FAA and manufacturer/type certificate holder guidance indicated that any seating configuration changes should be approved by either the FAA or the manufacturer/type certificate holder, and examination of the maintenance documentation for the accident airplane revealed that neither requirement had been satisfied. The seating modification was not approved by the FAA or any other agency or documented either via a supplemental type certificate and/or FAA Form 337 (Major Repair and Alteration). Postaccident review of the documentation that was used to substantiate the seating configuration change revealed that the modified seating position plan was not one of the manufacturer's/type certificate holder's

approved configurations. The document that was used to substantiate the change was determined to be an altered version of the manufacturer's original document, but it was incorrectly represented as a manufacturer's original document. Attempts to determine who made the improper and unauthorized changes to the seating configuration document, or when they were made, were unsuccessful.

METEOROLOGICAL INFORMATION

The FFZ 1854 automated weather observation included wind from 350 degrees at 5 knots, visibility 40 miles, few clouds at 20,000 feet, temperature 23 degrees C, dew point -1 degrees C, and an altimeter setting of 29.93 inches of Mercury. US Naval Observatory data for November 23, 2011, indicated that the moon, which was a waning crescent of 3%, set at 1605, and local sunset occurred at 1721.

AIDS TO NAVIGATION

Neither FFZ nor SAD was equipped with a VOR ground navigation facility. Navigation between the two airports via available VOR stations would result in an indirect flight route.

The flight from SAD to FFZ and the accident flight were both conducted in VMC as VFR flights. No flight plan was filed for either flight, and neither pilot had requested air traffic control (ATC) flight following services. Available radar data and interviews with PAI personnel indicated that the pilot had flown between SAD and FFZ several times previously and that he tended to use his iPad, equipped with ForeFlight software and GPS, to fly directly between the two. The software could display FAA VFR aeronautical charts (including FAA-published terrain depiction) and overlay airplane track and position data on the chart depiction. According to the pilot's brother, the pilot's habit pattern was to depart the airport, identify the track needed to fly directly to the destination, and turn the airplane onto that track. Remnants of an iPad were found in the wreckage. Damage precluded determination of its positive association with a particular owner, its functionality, or its operational status at the time of the accident.

Radar tracking data from the accident flight indicated that the airplane began its right turn on course to SAD about 1.5 miles northeast of FFZ. Comparison of the direct line track data from two different initial locations (FFZ, and northeast of FFZ after completion of the turn) to SAD revealed that while the direct track from FFZ to SAD passed about 3 miles south of the impact mountain, the direct track from northeast of FFZ to SAD overlaid the impact mountain location. That resulting ground track was also coincident with the accident flight radar data ground track.

COMMUNICATIONS

Sequence of Events

The pilot first contacted FFZ ground control at 1820:21. The pilot was instructed to taxi to runway 4R via taxiway D, and he taxied as instructed without incident. At 1823:35, the pilot contacted FFZ local control and advised that he was holding short and was ready for departure. The pilot was advised to again hold short to wait for landing traffic. At 1825:00, the controller instructed the pilot to "fly straight out" until advised due to landing traffic and cleared him for takeoff from runway 4R. The airplane became airborne at 1826:14. At 1826:47, the controller issued the "right turn approved" advisory to the pilot. At that point, the airplane was still on the runway heading, about 1.45 nautical miles (nm) from FFZ, and climbing through an altitude of about 2,200 feet. The pilot responded to the transmission with "right turn approved." No

further radio transmissions to or from the accident pilot were recorded.

AIRPORT INFORMATION

General

FFZ was equipped with two runways designated 4/22 L and R. The airplane's arrival and departure runway (4R) measured 5,101 feet by 100 feet. Airport elevation was 1,394 feet msl. The local topography consisted of a flat basin floor bounded by mountainous terrain, primarily to the north and east. FFZ was situated about 15 miles west-northwest of the impact mountain, which rose very steeply to a charted maximum elevation of 5,057 feet msl, or about 3,700 feet above FFZ.

WRECKAGE AND IMPACT INFORMATION

Accident Site

The accident site was on the northwest face near the top of the Flatiron region of Superstition Mountain. The accident site consisted of two basic terrain areas: a sloped area (about 45 degrees downhill to the northwest), abutted by a vertical rock formation on its southeast side.

The sloped area was primarily rock, interlaced with cracks, soil patches, boulders, and sparse vegetation. The rock formation rose about 100 feet above the southeastern edge of the sloped area. Airplane debris was scattered on the sloped area in a primary field that measured about 150 feet southeast-northwest by about 80 feet northeast-southwest. A significant amount of debris was clustered near the base of the vertical face, with some debris strewn or caught on the face. The southeast section of the sloped area and much of the vertical face were fire damaged, soot covered, or scorched. The northwest edge of the sloped debris field was about 150 feet southeast of the end of the sloped terrain, which then became very steep (sometimes near vertical) and fell irregularly away to the valley floor about 3,000 feet below.

On-Site Wreckage Observations

The impact site was located on steep rocky terrain at an elevation of about 4,500 feet msl that was essentially only accessible by helicopter. The wreckage was recovered by helicopter and transported to a secure facility for subsequent detailed examination.

The airplane was highly fragmented. The debris pattern axis was oriented northwest to southeast, and the debris and fire damage were arrayed in a fan-like pattern consistent with the approximate flight direction. Most airplane components were severely impact and fire-damaged. Some debris (heavier/denser items, such as engine gearbox components and generators) was found northwest (downhill) of the main debris field, consistent with those components rolling downhill after impact. The largest wreckage section was a portion of an inboard wing box with one engine attached. Paint transfer marks on the rock face were consistent with a wings-level (roll axis) impact.

Both engines and portions of their propellers were identified in the wreckage. Propeller, engine, and gearbox damage was consistent with high power rotation at impact. All three landing gear were identified in the wreckage, and damage patterns were consistent with the landing gear being retracted at impact. Some airplane skin segments exhibited significant accordion-like crush damage. Many cockpit-related items, including instruments, instrument panel sections, and pilots' seat fragments, were found on the terrain beyond the vertical rock formation; some were several hundred feet beyond the vertical rock formation.

Damage patterns were consistent with the engines developing power at the time of impact. The majority of the first-stage compressor impeller blades were separated at the hubs. The second-stage compressor impeller blades were bent opposite the direction of rotation. There was rotational scoring on the aft side of the third-stage turbine blade platforms and metal spray deposits on the suction side of the third-stage turbine blades. No preimpact discrepancies that would have precluded normal engine operation were identified.

The blade damage to both propellers was severe, with leading-edge damage, multiple bends, twisting, concave bending of the blade chord at the tips, and tips that had fractured and separated. Two separate blade angle witness marks were each consistent with impact while at a normal (not in feather and not in reverse) operating position. No preimpact discrepancies that would have precluded normal propeller operation were identified.

ORGANIZATIONAL AND MANAGEMENT INFORMATION

Ponderosa Aviation, Inc.

PAI was founded in 1975 by the pilot-rated passenger's father. Later, the pilot and his brother purchased the company, and, in January 2011, the pilot-rated passenger, who had worked there for many years, bought into a partnership with them.

At the time of the accident, PAI, which was based at SAD, employed 25 people, including 13 pilots (10 on a seasonal/part-time basis) and 9 maintenance personnel. PAI owned a total of 14 airplanes, including the accident airplane. The fleet included three Rockwell International (Aero Commander) 690 models and nine 500 models.

PAI held a 14 CFR Part 135 operating certificate for on-demand air carrier operations in the contiguous United States and the District of Columbia. However, PAI rarely exercised the privileges of that certificate and averaged about two revenue passenger transport flights per year. PAI's primary purpose for obtaining and maintaining the certificate was to be qualified to contract with the US Forest Service and the Bureau of Land Management for air attack missions (the application of aerial resources, by both fixed-wing aircraft and rotorcraft, on a fire).

Eight of the PAI airplanes were on the 14 CFR Part 135 certificate; the accident airplane had not yet been added to the certificate.

FAA Oversight

The FAA FSDO in Scottsdale, Arizona, was the assigned certificate-holding district office for PAI and oversaw about 60 Part 135 certificated operators, no Part 121 certificated operators, and about 520 Part 91 operators.

The POI was assigned to PAI in 2007. Her duties included oversight of 12 designees and 30 check airmen and POI for 54 operators. PAI was one of 10 Part 135 operators assigned to the POI. She estimated that she had about 100 hours in Rockwell International/Aero Commander airplanes, 25 of which were in the 690 model. The POI considered PAI to be a "low-maintenance operator," meaning that PAI was compliant with FAA requirements and presented few issues of concern. She physically visited PAI about once per year. Due to the distance between the FSDO and SAD, she never made unannounced visits. Her visits would take about 2 days, during which she would oversee pilot training, examine records and recordkeeping, and conduct base inspections and ramp checks. She never gave checkrides to PAI pilots; those were conducted by another inspector. The POI qualified the pilot-rated

passenger as a "good" chief pilot. He was the person at PAI with whom the POI had the most contact, and she would mainly communicate her concerns and questions to him. She did not have much familiarity with the pilot.

ADDITIONAL INFORMATION

Homeowner's Surveillance Camera Imagery

The airplane's preimpact flightpath, impact explosion, postimpact fire, and initial arrival of search and rescue aircraft were captured on a private citizen's home surveillance camera. That camera was located about 6 miles south of and 3,700 feet lower than the impact site. A file that contained about 50 minutes of image data, during the period from about 1810 to 1900, was provided to the National Transportation Safety Board (NTSB). The time stamp data was provided by the camera owner and was not independently correlated or verified by the NTSB; therefore, all times are approximate.

The 1810 image depicted the mountain in silhouette form, but as night fell, the mountain disappeared from the image. No lights were visible on the mountain. Due to the night conditions, the optical resolution capability of the camera, and the distance of the airplane from the camera, the imagery provided only a macro view and associated timeline of the events. The airplane itself was not visible; its position was manifested by its blinking beacon or strobe lights only. The lights of the airplane first appeared in the field of view at 1830:00 and remained visible until 1830:48, when the lights disappeared behind the terrain. A large flash of light appeared at 1830:52, followed by a second, much larger and brighter flash about 3 seconds later. Lights indicative of a fire remained visible until about 1844, and the first responding aircraft (again only visible as lights) appeared about 1848.

Examination of the path of the airplane's lights on the image field of view did not reveal any erratic motions or changes of direction; the stability of the flightpath was similar to that depicted in the ground tracking radar data.

Weight and Balance Information

Maintenance records indicated that on at least 15 occasions, modifications that affected the airplane's weight and balance values were accomplished; however, no records of the actual revised weight and balance data were discovered during the investigation.

Calculations that used the original empty weight plus other known or presumed values resulted in an estimated accident flight weight of 8,953 pounds, which was below the maximum allowable weight, and a center of gravity within the allowable envelope.

Airplane Performance

The derived level-flight ground speed for the last 2 minutes of the flight was approximately 190 knots, which was slightly higher than the pilot's operating handbook maximum range speed for similar conditions. Surface wind data indicated that the airplane would have experienced a slight tailwind during the climbout and level-flight segments.

TAWS-Related Guidance for FAA Inspectors

Published FAA guidance for FAA inspectors to use to determine whether the airplane seating configuration changes (if properly accomplished) would have exempted the airplane from the TAWS requirement was examined in detail. The relevant FAA guidance included FAA Order 8900.1 and 14 CFR Part 1, Part 21, Part 43 (Appendix 1), Part 91, and Part 135.

Phoenix Sky Harbor (PHX) Class B Airspace Information

The Phoenix metropolitan area was designated and charted as Class B airspace, centered on PHX and the PHX VOR (PXR). The airspace elevation boundaries were defined by floor and ceiling altitudes, with lateral boundaries defined by distance and bearing from defined locations. Class B airspace is typically described as having the shape of an "upside-down wedding cake," where the airspace floor altitudes increase as the distance from the center increases. Aircraft operating under VFR are prohibited from entering Class B airspace without explicit permission from the responsible ATC facility. Mountainous terrain rises to 4,500 feet less than 1 nm east of the 5-000-foot Class B airspace, and the terrain rises to a maximum elevation of 5,057 feet about 3 1/2 miles east.

The NTSB ATC group chairman's factual report provides detailed information regarding the Class B airspace around the Phoenix area. For more information, see the docket for this accident (NTSB case number WPR12MA046).

Controlled Flight Into Terrain (CFIT) Accidents

The FAA defines a CFIT accident as a situation that occurs when a properly functioning aircraft "is flown under the control of a qualified pilot, into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending collision."

In 1998, the FAA formed the General Aviation (GA) CFIT Joint Safety Analysis Team (JSAT) as part of the FAA "Safer Skies" program. The stated goal of the Safer Skies initiative was to significantly reduce fatal accidents over a 10-year period via a comprehensive review of aviation accident causes and implementation of safety intervention strategies. In April 1999, the GA CFIT JSAT published its final report, which identified 55 interventions to address CFIT accident causes. The FAA CFIT Joint Safety Implementation Team (JSIT) was formed to develop detailed CFIT accident reduction strategies based upon the top 10 JSAT interventions that were considered to be the most effective and feasible. The CFIT JSIT final report was published in 2000, and JSIT recommended interventions included the following:

- Improve safety culture within the aviation community,

- Promote development and use of low-cost terrain clearance and/or look-ahead device,

- Improve pilot training regarding decision-making and human factors,

- Enhance the biennial flight review and/or instrument competency check, and

- Develop and distribute mountain flying technique advisory material.

In March 2003, as part of its response to the CFIT JSIT, the FAA issued Advisory Circular (AC) 61-134, "General Aviation Controlled Flight Into Terrain Awareness." The AC "highlights the inherent risk" that CFIT poses for GA pilots. According to the AC, one primary cause of CFIT accidents was loss of situational awareness.

Situational Awareness

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25) defined situational awareness as the "accurate perception of the operational and environmental factors that affect the airplane, pilot, and passengers during a specific period of time." The handbook stated that a situationally aware pilot "has an overview of the total operation and is not fixated on one perceived significant factor." The handbook stated that "some of the elements inside the

airplane to be considered are the status of airplane systems, and also the pilot and passengers" and cautioned that "an awareness of the environmental conditions of the flight, such as spatial orientation of the airplane, and its relationship to terrain, traffic, weather, and airspace must be maintained."

The handbook stated that obstacles to maintaining situational awareness included fatigue, stress, and task overload and that a contributing factor in many accidents is a distraction that diverts the pilot's attention. Complacency was cited as another obstacle to maintaining situational awareness. When activities become routine, there is a tendency to relax and not put as much effort into performance. Like fatigue, complacency reduces a pilot's effectiveness in the cockpit. However, complacency is harder to recognize than fatigue, since everything is perceived to be progressing smoothly.

NTSB Safety Alert

In January 2008, the NTSB issued a safety alert titled "Controlled Flight Into Terrain in Visual Conditions: Nighttime Visual Flight Operations Are Resulting in Avoidable Accidents." The safety alert stated that recent investigations identified several accidents that involved CFIT by pilots operating under visual flight conditions at night in remote areas, that the pilots appeared unaware that the aircraft were in danger, and that increased altitude awareness and better preflight planning likely would have prevented the accidents.

The safety alert suggested that pilots could avoid becoming involved in a similar accident by proper preflight planning, obtaining flight route terrain familiarization via sectional charts or other topographic references, maintaining awareness of visual limitations for operations in remote areas, following instrument flight rules practices until well above surrounding terrain, advising ATC and taking action to reach a safe altitude, and employing a GPS-based terrain awareness unit.

History of Flight

Enroute	Controlled flight into terr/obj (CFIT) (Defining event)

Pilot Information

Certificate:	Commercial	**Age:**	31
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Unknown	**Last FAA Medical Exam:**	07/25/2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	09/24/2011
Flight Time:	(Estimated) 2500 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROCKWELL	**Registration:**	N690SM
Model/Series:	690 A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	11337
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	10250 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Prop
Airframe Total Time:	8188 Hours at time of accident	**Engine Manufacturer:**	Airresearch/Honeywell
ELT:		**Engine Model/Series:**	TPE-331
Registered Owner:	Ponderosa Aviation	**Rated Power:**	
Operator:	Ponderosa Aviation	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Night/Dark
Observation Facility, Elevation:	FFZ, 1349 ft msl	**Distance from Accident Site:**	17 Nautical Miles
Observation Time:	1854 MST	**Direction from Accident Site:**	275°
Lowest Cloud Condition:	Few / 20000 ft agl	**Visibility**	40 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	350°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	23°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Mesa, AZ (FFZ)	**Type of Flight Plan Filed:**	Unknown
Destination:	Safford, AZ (SAD)	**Type of Clearance:**	None
Departure Time:	1826 MST	**Type of Airspace:**	

Airport Information

Airport:	Falcon Field (FFZ)	**Runway Surface Type:**	
Airport Elevation:	1394 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 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	5 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	
Total Injuries:	6 Fatal	**Latitude, Longitude:**	33.439167, -111.450556

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	**Report Date:**	12/03/2013
Additional Participating Persons:	Leon P Kelley; FAA FSDO; Scottsdale, AZ Lori J Schenewark; FAA FSDO; Scottsdale, AZ Tom McCreary; Hartzell Propeller; Piqua, OH Geoffrey Pence; Twin Commander; Arlington, WA Marlin Kruse; Honeywell Aerospace; Phoenix, AZ Patrick Keane; NATCA; San Diego, CA		
Publish Date:	12/03/2013		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=82380		