Aviation Investigation Final Report

Location:	Big Creek, Idaho	**Accident Number:**	WPR14LA271
Date & Time:	June 29, 2014, 08:10 Local	**Registration:**	N132K
Aircraft:	Cessna 182Q	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The owner/pilot was participating in a fly-in to a backcountry airport that he had flown into once about 2 years before. He was the last of his group to arrive in the airport vicinity, and he reported that he was using his GPS, published guidance, and information from fellow pilots to navigate to and enter the airport's traffic pattern. The pilot stated that on the base leg, he determined that the airplane was higher and much closer to the runway than he anticipated. In response, he initiated a left-wing-down slip to lose altitude, and shortly thereafter, while concurrently attempting to maintain the slip, he initiated a left turn to align with the final approach path. Almost immediately after the turn began, the airplane stalled, descended, and impacted trees and terrain about 800 feet short of the runway threshold. Postaccident examination of the airplane revealed no evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation. Although the pilot reported that he extended the flaps to 40 degrees on the downwind leg, the flaps were found extended to 15 degrees.

A published arrival procedure suggested a traffic pattern altitude of 800 to 1,000 ft above field elevation (AFE) and a final leg about 1 mile in length. A ridge between the runway and the downwind leg limited pilots' view of the airport while on downwind, and the 1-mile final provided an opportunity to detect airborne or ground traffic sufficiently early to allow pilots to safely compensate for the traffic. Analysis of data from an onboard GPS device revealed that the pilot's traffic pattern differed significantly from the published pattern. His downwind leg began at an altitude of about 800 ft AFE but then descended continuously at a rate of about 400 ft per minute. Also, the pilot made about a 70 degree turn to base leg when the airplane was abeam the threshold. Turning less than 90 degrees resulted in a base leg oriented away from the runway and necessitated a turn of about 110 degrees to align with the final approach course. Further, turning early rather than continuing until the airplane was about 1 mile from the threshold, as suggested, put the airplane on a base leg that was very close to the runway. Despite the descending downwind leg, the airplane's position at the point that the pilot began his turn to final required a steep approach slope (about 10 degrees) to arrive near the threshold in position for a normal landing. When the pilot recognized that the airplane was too high and too close to the runway to use a normal approach slope (about 4 degrees), he could have opted to discontinue the landing attempt and execute a go-around. However, the pilot stated that he continued the approach because he believed that successful completion of the landing was well within his and the airplane's capabilities.

The pilot reported that he used approach speeds similar to the airplane's original certificated airspeeds, but the investigation was unable to determine the pilot's actual traffic pattern airspeeds. The investigation was also unable to determine the reason for the difference between the pilot's reported flap setting of 40 degrees and the as-found setting of 15 degrees; it is possible that the pilot began retracting the flaps after the airplane stalled. If the flaps were set to 15 degrees when the pilot believed them to be at 40 degrees, and if he was flying at the lower airspeed appropriate for the greater flap extension, this would have reduced his stall margin. Finally, the pilot's intentional slipping of the airplane while in the turn to final resulted in a steep, uncoordinated turn, which increased the airplane's susceptibility to a cross-control stall.

The airplane was extensively modified from its original Federal Aviation Administration (FAA) certificated design by the installation of five significant aerodynamic or performance-related modifications that were approved through the FAA's supplemental type certificate (STC) process. Although this combination of STC modifications was commonly installed on the same airplane, each of the STC modifications was developed by a different company with very limited or no coordination between them. In addition, only two of the STCs were approved by the same FAA office, and there was very limited or no coordination between any of the other FAA offices.

Although the STCs were primarily marketed as modifications that would provide short takeoff and landing capability to the airplane, the FAA-approved performance data that was provided with the STCs differed significantly from and did not support some of the advertised performance gains. In addition, in some cases, the STCs' pilot's operating handbook supplements provided conflicting performance data, and there was no guidance provided regarding which performance data was applicable to the final airplane configuration. Further, those STC modifications that were made to the accident airplane were frequently installed together on the same airplane, yet no definitive FAA-approved performance data was available to the pilot to operate the airplane. Further, in this accident, the pilot could also have been motivated to operate the airplane in a manner that capitalized on the advertised performance benefits of the installed STCs.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's execution of a traffic pattern that did not put the airplane in position for a normal final approach and the pilot's decision to continue the landing attempt instead of initiating a go-around, which resulted in the airplane exceeding its critical angle-of-attack and experiencing an aerodynamic stall at an altitude too low to prevent ground impact.

Findings

Personnel issues	Incorrect action selection - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Capability exceeded
Aircraft	Altitude - Not attained/maintained
Environmental issues	(general) - Contributed to outcome

Factual Information

History of Flight

Approach-VFR pattern base	Loss of control in flight
Approach-VFR pattern base	Aerodynamic stall/spin (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On June 29, 2014, about 0810 mountain daylight time, a Cessna 182Q, N132K, was substantially damaged when it impacted trees and terrain while maneuvering in the traffic pattern to land on runway 19 at Big Creek airport (U60), Big Creek, Idaho. The owner/pilot was seriously injured. The personal flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no Federal Aviation Administration (FAA) flight plan was filed for the flight.

The pilot planned to fly his airplane, in a pre-arranged group of several other airplanes, into U60 to attend a fly-in breakfast event there. The airport was considered a "backcountry" airport, denoting that it is situated in mountainous terrain, and typically requires approach and/or departure procedures that are more demanding and less forgiving than most airports.

According to an eyewitness, who was part of the group, and who had already landed, he saw the airplane during the last 20 to 30 degrees of its turn from base to final, after it "came around the Hogback," a ridge parallel to and on the left downwind leg side for runway 19. The witness's impression was that the airplane was "really low and slow" for its position relative to the runway. He estimated that the airplane was at about "one third [of] the height" that an airplane would normally be for the base-to-final turn. However, the witness was not certain about how far out on the final leg the airplane was when it made the turn, and he allowed that it could have been significantly closer to the runway than was normal for that airport. The witness did not see the airplane long enough or well enough to observe its flap configuration. The witness stated that he observed the airplane pitch "immediately nose down and left" as it made the turn. He heard the application of "full [engine] power," and the airplane descended behind the trees.

According to the pilot, he had entered the traffic pattern, and was transitioning from the base leg to final when the airplane departed controlled flight, descended rapidly into the trees, and impacted the ground. The airplane came to rest inverted in a ravine forested by tall trees, about 800 ft short of the runway.

PERSONNEL INFORMATION

FAA records indicated that the pilot held a commercial pilot certificate with airplane single engine land and instrument airplane ratings. According to information provided by the pilot, he had approximately 1,267 total hours of flight experience, including approximately 520 hours in the accident airplane make and model. His most recent flight review was completed in December 2012, and his most recent FAA third-class medical certificate was issued in June 2012. The pilot reported that he had flown into U60 one time previously, about 2 years before the accident flight.

According to FAA records, in September 2009, the pilot was attempting to conduct a touch-and-go in the same airplane on a "182 yard" (546 ft) long gravel bar in the Willamette River near Newberg Oregon, which resulted in the airplane becoming "completely submerged" in the river.

AIRCRAFT INFORMATION

The airplane was manufactured in 1979 as Cessna serial number 18266782, with an original registry of N96609. It was purchased by the pilot in July 2007, and re-registered by him as N132K in February 2008.

FAA records indicated that between January and April 2008, the airplane was modified to incorporate numerous major alterations, primarily by means of FAA Supplemental Type Certificates (STCs). An STC is the FAA's approval of a major change in the type design of a previously type certificated product. STCs are primarily issued by FAA Aircraft Certification Offices (ACO).The STC changes incorporated into the accident airplane included, but were not limited to, installation of the following:
- Continental IO-550 engine
- 3-blade propeller
- Canards
- Wingtip extensions (37 inch span increase)
- Oversized wheels and tires

METEOROLOGICAL INFORMATION

The 0751 automated weather observation at McCall Municipal Airport (MYL), McCall, Idaho, located about 36 miles southwest of the accident site, included calm winds, visibility 10 miles, clear skies, temperature 8 degrees C, dew point 6 degrees C, and an altimeter setting of 30.08 inches of mercury.

AIDS TO NAVIGATION

The pilot used his portable GPS device, published guide information, and information from fellow backcountry pilots to navigate to the airport, and in its traffic pattern. The pilot's airplane was the last of a small, pre-coordinated group of airplanes that traveled from MYL to U60. All the other airplanes in the group had already landed when the accident occurred.

AIRPORT INFORMATION

According to FAA information, U60 was at an elevation of 5,743 ft above mean sea level (msl), and was equipped with a turf runway that measured 3,550 by 110 ft. The runway was designated 1/19.

The Idaho Division of Aeronautics (IDA) published a series of "Airport SOPs" (standard operating procedures) for many backcountry airports, including U60. The IDA U60 SOP suggested a left-hand traffic pattern with an altitude of 800 to 1,000 ft above the field elevation (AFE), which result in traffic pattern altitudes between 6,543 to 6,743 ft msl. The SOP also depicted a suggested arrival and traffic pattern ground track, which included an upwind leg offset to the west-northwest of the runway, a downwind leg offset about 1/2 mile from the runway, and a base turn location which resulted in a final leg length of approximately 1 mile. The IDA Pilot and Safety/Education Coordinator stated that the upwind leg was intended to enable the arriving pilots to view the airport and assess its conditions, traffic, and wind. He also noted that because the runway was not normally visible from the downwind leg, due to its obscuration by the Hogback Ridge, which was parallel to and east-southeast of the runway, the 1 mile final was intended to enable pilots to detect airborne or ground traffic sufficiently early to allow them to safely compensate for the traffic.

The IDA-prescribed traffic pattern, when flown at a traffic pattern altitude of 1,000 ft AFE, and utilizing a constant descent profile beginning at the point abeam the threshold, would result in a descent slope of about 400 ft per nm, or a descent angle of about 3.7 degrees. Based on that constant slope profile, the turn to base leg would occur at an altitude of about 6,343 ft msl (600 ft AFE), and the turn to final would occur at an altitude of about 6,143 ft msl (400 ft AFE). High terrain in close proximity to the airport could necessitate a slight offset of the final approach track to the east, in order to concurrently maintain the constant descent profile and adequate terrain clearance.

WRECKAGE AND IMPACT INFORMATION

FAA personnel arrived at the accident site on July 1, 2014; they were the only investigative personnel to examine the airplane on scene. According to FAA inspectors, the airplane came to rest in an inverted position in a heavily wooded area. They estimated the trees to be about 50 ft tall, and observed multiple tree fragments on top of the wreckage.

The wreckage was tightly contained, and all major components were accounted for on scene. The airplane was adjacent to a ground scar that was consistent with an engine and propeller impact. The right wing was fracture-separated from airplane at the root, and located just aft and outboard of the left wing, which remained attached to airplane. The aileron crossover/balance cable was the only remaining attachment between the right wing and the airplane. The nose landing gear assembly was found approximately 40 ft forward of the main wreckage area, and both main wheel and tire assemblies were fracture-separated from their respective landing gear struts. The engine cowl flaps were found in the closed position. All engine controls were found in the full forward position. The flap control handle was found in the full up position, but the flap position indicator needle was found near the 40 degree (full down) position.

The wreckage was recovered to a secure facility by recovery personnel, for detailed examination by Cessna, Continental Motors, FAA, and NTSB personnel. The right side of the airplane sustained the most damage. Aircraft recovery personnel detached the left wing from the fuselage, and the left flap from the left wing. The left aileron remained attached to the left wing. The right flap and aileron remained attached to the right wing.

Witness marks on the fuselage from the left flap indicated that the left flap was extended about 15 degrees at the time of impact. The right flap was wedged in a fixed position due to impact damage, and was found to be extended approximately 15 degrees. The flap jack screw measured 3 1/4 inches, which equated to 15 degrees flap extension.

The empennage was separated from the fuselage by recovery personnel. The vertical stabilizer and both horizontal stabilizers remained attached to the empennage, and all three stabilizers retained their respective control surfaces. Flight control continuity was established for the flaps, ailerons, elevators, and rudder. The two canards remained attached to the airframe. Each canard consisted of a fixed forward panel and a movable aft panel. Control continuity for the canards was established.

The engine mounts were fracture-separated, and the engine remained attached to the airframe only via control cables and wires. There was no external evidence of operational distress or other non-impact damage on the crankcase and cylinders. A borescope inspection of the cylinders did not reveal any anomalies with the cylinder barrels, pistons, valves, or valve seats. The crankshaft was manually rotated, and crankshaft and camshaft continuity was confirmed. Thumb compressions were obtained on all six cylinders, and sparks were obtained on all six top ignition leads, in firing order, during crankshaft rotation. Cockpit to engine control continuity was established. Most engine components and accessories were examined in detail, and no pre-impact anomalies were noted.

The propeller was fracture-separated from the crankshaft propeller flange. The three all-metal propeller blades remained attached to the propeller hub. All blades exhibited S-bending and blade twisting.

No pre-impact anomalies with the fuel system were observed. The cockpit fuel selector was found set to the left tank.

No pre-impact mechanical anomalies, failures, or deficiencies that would have precluded normal operation and continued flight were observed. Refer to the NTSB public docket for this accident for additional details.

ADDITIONAL INFORMATION

STC Modifications and Airplane Performance

The airplane configuration was significantly modified relative to its original FAA-certificated configuration. Aerodynamic changes consisted of a 37-inch increase in wing span, and new fixed and movable aerodynamic surfaces (canards) forward of the cockpit. Other major changes included a more powerful, heavier engine, a 3-blade propeller, and a 150 pound increase in maximum allowable takeoff weight, with resultant changes to the CG envelope. Each of these changes was accomplished via the FAA STC process.

Four of the five significant performance-related STCs were accompanied by FAA approved "POH Supplements," which contained information regarding the operation of the airplane as a result of the incorporation of the particular STC modification. According to the current holder of the canard STC (SA485SW), due to its "early" (1960s) origination date, no POH supplement was created for that STC, and there were "no performance changes" associated with that STC. In addition, although there was a separate POH supplement for the engine STC (SA00152WI) and the 3-blade propeller STC (SA00727WI), the SA00152WI POH supplement indicated that the 3-blade propeller installation was part of the engine installation and the related published performance.

The SA00152WI POH supplement indicated that the maximum flap extension was limited to 35 degrees; the original Cessna maximum flap extension limit was 40 degrees. The cockpit flap position indicator cited the maximum flap extension position as "FULL," and the investigation did not determine the actual maximum flap extension limit.

The only significant published POH change associated with the wingtip extension STC (SA00276NY) was a decrease in the Vne (never exceed speed) from the original Cessna value of 179 KIAS (knots indicated air speed) to 157 KIAS. The airplane's airspeed indicator yellow arc (caution range) and redline (Vne indication) had not been modified to reflect the lower Vne, but in accordance with the POH supplement, the instrument panel contained an annotation that presented the revised Vne.

The POH supplements from the engine installation STC (SA00152WI) and the gross weight increase STC (SA03608AT) each contained multiple performance-related changes, and many of those changes were to the same parameters, including climb speeds, maneuvering speeds, and stall speeds. Neither of the POH supplements accounted for the incorporation of the other STC, and neither informed the pilot as to which parameter set has precedence over the other one in the event of a conflict between the two. Review of the performance-related data from those two POH supplements revealed multiple differences between the two datasets.

The original Cessna climb speeds (Vx and Vy) were 57 and 78 KIAS respectively, the SA00152WI Vx and Vy were 59 and 83 KIAS respectively, and the SA03608AT Vx and Vy were 59 and 81 KIAS respectively. The airplane instrument panel contained an annotation that Vx was 57 KIAS, and Vy was 78 KIAS.

The original Cessna maneuvering speed (Va) was 109 KIAS at gross weight, the SA00152WI Va was 112 KIAS, and the SA03608AT Va was 111 KIAS. The airplane instrument panel contained an annotation that Va was 111 KIAS.

The SA00276NY POH supplement stated that the stall speeds with the wingtip extensions installed "are approximately the same as the basic aircraft." The original Cessna POH, and each of the POH supplements for SA00152WI and SA03608TA contained tables of stall speeds as a function of CG location, bank angle, and flap setting. The published SA03608TA stall speed values are only applicable to weights above the original Cessna maximum gross weight of 2,950 pounds. Comparison of the table values revealed that all three sources provided different stall speed values. The lower end of airspeed indicator white arc was in accordance with the original Cessna stall speed value, which differed from the two corresponding published STC values.

The four cited STC POH supplements contained limited information regarding takeoff performance. Neither SA00276NY (wing extensions) nor SA00152WI (engine/propeller) presented any takeoff performance information or remarks. SA00727WI (propeller) stated that takeoff performance would be "improved," but did not provide any data. SA03608 (gross weight increase) presented a takeoff distance table in the same format as the original Cessna table; the STC table indicated that takeoff distances would increase by about 12 percent.

The four cited STC POH supplements contained very limited data regarding landing performance. Neither SA00276NY nor SA03608AT presented any landing performance information or remarks. SA00727WI (propeller) stated that landing distances were "unchanged," but SA00152WI (engine/propeller) stated that landing distances were to be increased by 5 percent.

SA00152WI stated that 1 knot should be added to approach speeds. That increment was the only mention of approach speeds in any of the POH supplements, despite the fact that approach and traffic pattern speeds are primarily a function of stall speeds, and the existence of the above-described stall speed changes.

Additional detailed information can be found in the NTSB public docket for this accident.

STC Vendor Information

The engine, propeller, and canard installations were the major elements of a performance enhancement package marketed as the "King Katmai" C-182 conversion by the company Peterson's Performance Plus. The company's web site stated that it was the manufacturer of the "World's Safest, High Performance Utility Aircraft," and that the King Katmai was the "Perfect Backcountry Aircraft."

The web site contained the following performance-related information regarding the King Katmai conversion:
- "The Katmai's advanced aerodynamics provide additional lift for those ultra-short back country sites"
- The "nose-mounted canard has a functioning elevator that is integrated with the flight control system," which "provides additional lift" and "reduces the stall speed and improves the stall resistance"
- The canard "reduces the take off and landing distances"

The Peterson web site explicitly cited a stall speed of 31 knots with 20 degrees of flaps, and takeoff and landing distances of 290 ft.

The wingtip extensions were a product of Air Research Technology (ART) and marketed as "Wing-X STOL." ART marketed the extensions as a means of improving takeoff and climb performance, and increasing gross weight. The ART web site contained the following information regarding the wingtip extensions:
- "Reduced stall speed"
- "Reduced takeoff and landing distances"
- "Increased takeoff performance by as much as 30%"
- "Increased rate of climb by 12%"
- "STC approved in combination with other STOL kit modifications on all series of Cessna...182" airplanes

Review of FAA-approved performance data in the original Cessna POH and all the STC POH supplements indicated that neither the Peterson nor the ART/Wing-X advertised performance values were supported by the published data, and that the Peterson-advertised values were significantly more optimistic than those in the published/approved data. In addition, the investigation did not locate any evidence to support the ART/Wing-X statement regarding that the STC was "approved in combination" with other modifications.

When an FAA representative was asked for the FAA position regarding the discrepancies between the vendor advertised performance and the FAA-approved data, the FAA representative responded that the FAA "can't control what companies claim or advertise on marketing brochures or websites." The representative stated that if the POH supplement did not contain any performance data, then "the basic Owner's Manual and AFM/POH should be used by the operator," and that the FAA continues "to reiterate to operators or pilots that the basic Owner's Manual and AFM/POH is what they must follow."

STC Compatibility

Each of the five above-discussed performance related modifications was accomplished via five separate STCs by five separate STC applicants. The five separate STCs for these changes were approved by four separate FAA offices.

Although there was evidence that the engine and propeller STC development and approval were partly coordinated with one another, there was no evidence of any coordination between the STC applicants or the FAA offices for the development or approval of the wing span, canard, or gross weight STCs, or their respective changes to the POH. Although the modifications from those independent STCs were installed on the same airplane, there was no FAA requirement to determine the compatibility or adverse interactions of the various, concurrently-installed STC modifications. There was no evidence that any such compatibility/interaction testing or determinations by any STC applicant was accomplished, despite the fact that several of the STCs were frequently installed on the same airplanes as part of the King Katmai conversion.

In addition, despite the facts that some of the POH supplements provided conflicting performance data, and that those modifications were frequently installed together, there was no guidance regarding which performance data was applicable to the final airplane configuration.

Previous NTSB Recommendations Regarding STC Compatibility

In May 2012, in response to two accidents involving airplanes that had multiple STC modifications installed, the NTSB issued three safety recommendations (A-12-021 to -023) that were intended to address the issues associated with STC compatibility. In the subject investigations, NTSB findings included "the adverse effects of multiple STCs to the airframe wing structure that were not evaluated at the time the STCs were installed," a "lack of accurate performance data," a "lack of guidance by the Federal Aviation Administration (FAA) for multiple STC interaction evaluation," and a "lack of guidance by the FAA for an installer of an STC modification to determine the interrelationship between all STCs incorporated into an aircraft."

As of October 2015, the FAA was actively continuing its attempt to address the issues identified by the NTSB, and the NTSB has classified the safety recommendation status as "Open- Acceptable Response," denoting that the NTSB was satisfied with the FAA progress and plans, but that the FAA activity has not been completed.

FAA Guidance Regarding STCs

FAA Advisory Circular (AC) 21-40A, issued in September 2007, is the FAA's certification guide for applicants attempting to obtain FAA approval of an STC. The AC did not contain any explicit requirements for, or references to, compatibility determinations with other STCs.

In June 2012, the FAA issued Special Airworthiness Information Bulletin (SAIB) CE-12-37, entitled "STC Modification Airworthiness Interrelationship." The SAIB was related to the NTSB Safety Recommendations cited previously, and was specifically concerned with the proper marking of airspeed indicators. However, the SAIB did address STC compatibility concerns. The SAIB stated that an STC "installer must determine whether the design change is compatible with previously approved modifications." The SAIB then provided several recommended actions, including:
- "For new installations of STCs, the installer of one or more incorporated modifications that may impact the airplane's performance and/or handling characteristics conduct a thorough evaluation of the

safety impact of the changes being made by the new STCs with the changes made by all previously installed STCs on the airplane," particularly regarding "airspeed or performance limitations."
- "For existing multiple STC installations (already installed on aircraft), owners/pilots/mechanics review existing STC installations to determine if there are any potential compatibility issues."
The SAIB then provided details for obtaining additional necessary or relevant information in order for "owners/pilots/mechanics" to evaluate STC compatibility.

Pilot's Approach Procedures

In his written statement dated July 9, 2014 regarding the accident the pilot stated the following:
"I descended into the down wind leg directly from the south. In the downwind leg, I performed pre-landing checklist, slowed the aircraft to 60 knots and lowered flaps to 40 degrees. I do not recall my altitude on downwind, but I do remember entering the airport altitude in my EFIS for reference. When I turned to base at the north end of the hogs back, I noticed that I was high and the threshold of the landing strip was much closer than I anticipated. Initiating a steep turn to final and attempting to slip to loose (sic) altitude, with in seconds I was in a stall, with the IAS at 25 knots (stall in this configuration is around 38 knots). I immediately attempted to recover with full power and level wings, which put [the airplane] on the reverse course of base leg."

In an August 6, 2014, telephone interview with the NTSB, the pilot was asked to describe the approach procedures (especially configuration and speeds) he used in the airplane. The pilot stated that he typically flew two different approaches, primarily as a function of whether he was landing on a large, paved runway, or on a shorter or unpaved backcountry runway. When possible/practical, the pilot preferred to use his backcountry approach at the larger airports. His normal procedures for backcountry patterns were to arrive on downwind between about 110 to 100 kts. Abeam the threshold, he would reduce power, slow to less than 100 kts, and extend 20 degrees of flaps. Prior to turning base leg, at a speed of about 85 knots, he would extend the flaps to 30 degrees. He normally flew final at 60 to 55 kts, with 30 degrees of flaps. The pilot normally landed with 30 degrees flaps, although the airplane was equipped for 40 degrees of flaps. If the runway was excessively short, the pilot stated that he would use 40 degrees of flaps.

In a December 2015 telephone interview with the NTSB, the pilot clarified that he began a left-wing slip while on base leg, and then began the left turn to final. The airplane stalled very soon and very quickly after the turn began. The pilot did not recall any specifics that could explain the previously-noted flap position discrepancy. Finally, he reported that he was confident in his and the airplane's ability to successfully negotiate the turn and complete the landing, and therefore did not execute a go around.

GPSMap 695

A Garmin GPSMap 695 was recovered from the airplane and sent to the NTSB recorders laboratory in Washington DC for data download. Data from the accident flight was successfully recovered from the device.

The GPSMap recorded time and position data, including altitude, which enabled the recreation of the airplane flight track. The accident flight recording began at McCall Municipal Airport (MYL) at 1316:59 UTC (Universal Time Coordinated, or 0716:59 MDT), and ended near U60 at 1408:35 UTC (0808:35 MDT).

The GPS data showed that the airplane arrived from the west, and did not fly the upwind familiarization leg; instead it entered the traffic pattern on a modified crosswind leg oriented about 45 degrees to the downwind leg. About 0807:06, the airplane entered an approximate downwind leg; at that time its GPS altitude was 6,519 ft, and the derived groundspeed was 80 knots (kts). The turn to base leg began when the airplane was approximately abeam the runway 19 threshold. At 0808:07 the airplane was in its turn from downwind to base leg; at that time its GPS altitude was 6,135 ft, and the groundspeed was 59 kts. The base leg turn was through an arc of about 70 degrees, instead of the usual 90 degrees. That incomplete turn resulted in a base leg that was oriented away from the runway, and which required a turn arc of 110 degrees to align the airplane with the final approach course.

The descent rate on the base leg was similar to that on the downwind leg, approximately 400 ft per minute (fpm). The groundspeed varied irregularly during the approximately 20 seconds that the airplane was on the base leg. At 0808:29 the airplane was in its turn from base to final; at that time its GPS altitude was 5,919 ft, and the groundspeed was 53 kts. The last two GPS data points, each 3 seconds after its predecessor, indicated a rapid altitude decrease and heading change to the left. The last recorded GPS altitude was 5,673 ft.

The pilot began the turn from base leg to final when the airplane was about 1,300 ft from the threshold, or less than one quarter of the IDA-suggested distance. The altitude and location of the airplane at the beginning of that turn would have required an approach path slope of about 9.6 degrees in order to arrive at the threshold in position for a normal landing.

JPI EDM-930

A J.P. Instruments (JPI) EDM-930 was recovered from the airplane and sent to the NTSB recorders laboratory in Washington DC for data download. Data from the accident flight was successfully downloaded from the device.

The EDM-930 was a panel mounted device that enabled the operator to monitor multiple engine operational parameters, and stored multiple flights in its non-volatile memory for future reference. Recorded parameters for this device included engine RPM, fuel flow, and cylinder and exhaust gas temperatures. Parameters were recorded at a frequency of 10 samples per minute.

EDM device time is set by the user, and maintained by an internal clock. Comparison of the EDM time with actual time required a shift of 4,176 seconds to align the EDM time with actual time. The NTSB laboratory examination report further noted that EDM tolerances and data ambiguity between the EDM and the GPS could result in an EDM time that differed from GPS time by up to 2 minutes. Comparisons of the EDM and GPS data near the end of the recordings indicated that after the application of the 4,176 second correction, the addition of 5 or 6 seconds to the EDM time resulted in closer alignment of the datasets from the two devices.

Review of the EDM data did not reveal any engine operating abnormalities, which was consistent with the pilot's indications regarding lack of engine problems. The engine parameters were all within normal and expected limits during the flight, including the traffic pattern maneuvering. About 20 seconds before the end of the data, the rpm began decreasing smoothly to a flight idle setting, but then the final two data points indicated a rapid increase to a peak of 2,660 rpm, a value close to the maximum allowable rpm of

2,700 rpm. This rpm increase is consistent with the pilot's recount of events, and the witness's observations.

Additional details, including the data downloads from both the GPS and EDM devices, can be found in the NTSB public docket for this accident.

Go Around (Rejected Landing) Information

A go-around, or rejected landing, is the discontinuation of a landing approach, and is often followed by an attempt to conduct another approach and landing at the same airport. The FAA Airplane Flying Handbook (AFH, H-8083-3) stated that "Whenever landing conditions are not satisfactory, a go-around is warranted," and noted that many factors can contribute to unsatisfactory landing conditions, including an unstabilized approach. The AFH defined a stabilized approach as "one in which the pilot establishes and maintains a constant angle glidepath towards a predetermined point on the landing runway."

The AFH noted that a "go-around is not strictly an emergency procedure. It is a normal maneuver that may at times be used in an emergency situation." The AFH also stated that "Although the need to discontinue a landing may arise at any point in the landing process, the most critical go-around will be one started when very close to the ground. Therefore, the earlier a condition that warrants a go-around is recognized, the safer the go-around/rejected landing will be."

The AFH stated that delay in initiating the go-around normally stems from two sources: "(1) landing expectancy, or set - the anticipatory belief that conditions are not as threatening as they are and that the approach will surely be terminated with a safe landing, and
(2) pride - the mistaken belief that the act of going around is an admission of failure - failure to execute the approach properly."

The FAA Pilot's Handbook of Aeronautical Knowledge (PHAK, FAA H-8083-25A) offered several suggestions for increasing the likelihood of a successful landing approach, including:
- "Make frequent reference to the altimeter...during all approaches"
- "If possible, conduct aerial visual inspection of unfamiliar airports before landing"

Cross-Control Stall

The FAA AFH defined a cross-control stall as the "type of stall [that] occurs with the controls crossed - aileron pressure applied in one direction and rudder pressure in the opposite direction." The AFH stated that the "objective of a cross-control stall demonstration maneuver is to show the effect of improper control technique and to emphasize the importance of using coordinated control pressures whenever making turns." The AFH continued that such a stall may occur "when excessive back-elevator pressure is applied," and that it "is most apt to occur during a poorly planned and executed base-to-final approach turn."

The AFH described the control inputs and control surface deflections as follows:
"Normally, the proper action...[to sharpen a turn]...is to increase the rate of turn by using coordinated aileron and rudder." Uncoordinated use of the rudder and ailerons can result in pilots attempting to "hold the bank constant and attempt to increase the rate of turn by adding more rudder pressure in an effort to align it with the runway." The AFH then described the individual control inputs and airplane responses, and concluded that the "resulting condition is a turn with rudder applied in one direction, aileron in the

opposite direction, and excessive back-elevator pressure—a pronounced cross-control condition. Since the airplane is in a skidding turn during the cross-control condition, the wing on the outside of the turn speeds up and produces more lift than the inside wing; thus, the airplane starts to increase its bank. The down aileron on the inside of the turn helps drag that wing back, slowing it up and decreasing its lift, which requires more aileron application. This further causes the airplane to roll. The roll may be so fast that it is possible the bank will be vertical or past vertical before it can be stopped."

The above-described rudder and aileron inputs are similar to those used to intentionally slip an airplane in order to increase descent rate without significantly increasing airspeed.

The AFH noted that "In a cross-control stall, the airplane often stalls with little warning. The nose may pitch down, the inside wing may suddenly drop, and ... is usually the beginning of a spin." The AFH concluded that "Recovery must be made before the airplane enters an abnormal attitude," and that the "pilot must be able to recognize when this stall is imminent and must take immediate action to prevent a completely stalled condition. It is imperative that this type of stall not occur during an actual approach to a landing, since recovery may be impossible prior to ground contact due to the low altitude."

Pilot Information

Certificate:	Commercial	**Age:**	71,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 15, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1267 hours (Total, all aircraft), 520 hours (Total, this make and model), 1200 hours (Pilot In Command, all aircraft), 15 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N132K
Model/Series:	182Q	**Aircraft Category:**	Airplane
Year of Manufacture:	1979	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	18266782
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 4, 2014 Annual	**Certified Max Gross Wt.:**	3100 lbs
Time Since Last Inspection:	8 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1918 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C126 installed	**Engine Model/Series:**	IO-550 SERIES
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KMYL,5024 ft msl	**Distance from Accident Site:**	42 Nautical Miles
Observation Time:	07:51 Local	**Direction from Accident Site:**	230°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ Unknown
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	8°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	McCall, ID (MYL)	**Type of Flight Plan Filed:**	None
Destination:	Big Creek, ID (U60)	**Type of Clearance:**	None
Departure Time:	07:43 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Big Creek U60	**Runway Surface Type:**	Grass/turf
Airport Elevation:	5743 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	19	**IFR Approach:**	None
Runway Length/Width:	3550 ft / 110 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	44.241252,-114.479026(est)

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Dan Frandson; Federal Aviation Administration FSDO; Boise, ID Jan R Smith; Cessna - Textron Aviation; Wichita, KS Nicole Charnon; Continental Motors; Mobile, AL
Original Publish Date:	January 14, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89558