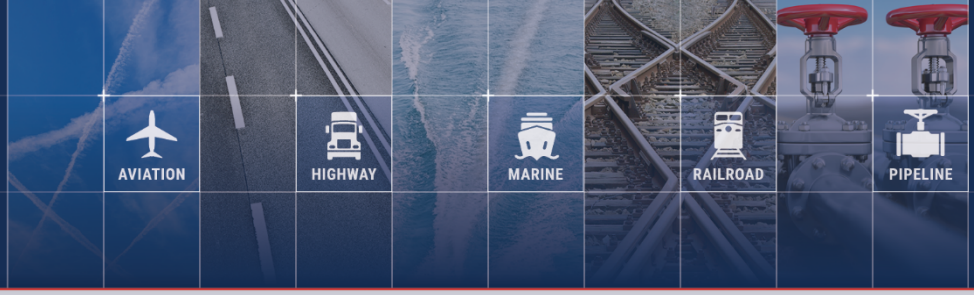


Aviation Investigation Final Report

Location:	Angwin, California	**Accident Number:**	WPR21FA273
Date & Time:	July 16, 2021, 08:40 Local	**Registration:**	N112TW
Aircraft:	Beech V35	**Aircraft Damage:**	Destroyed
Defining Event:	Abnormal runway contact	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane departed with visual meteorological conditions for a daytime cross-country flight. Flight track information showed the airplane descending from 9,000 ft mean sea level (msl) and entering the left downwind leg for runway 16 at the destination airport. The flight track showed a wide left base turn to final that overshot the final approach course. The airplane then reacquired the runway heading and landed.

A video recording device was installed on the accident airplane, which captured the entire flight along with audio. The video showed that although the left-seat pilot was controlling the airplane during most of the cross-country portion of the flight, once the flight neared the destination airport the airplane's throw-over yoke was moved to the right-seat pilot (the pilot), who then controlled the airplane for the rest of the flight.

The pilot descended the airplane, and it entered the left downwind leg of the traffic pattern for the runway. The left base turn was then rounded to a turn to the final approach leg. The video shows that the airplane had entered a left bank of about 30°, the airspeed indicator displayed about 150 mph, and the altitude was 3,000 ft msl (1,125 feet above ground level [agl]). Throughout the approach, the pilot manipulated the yoke with both hands and attempted to correct the airplane's flightpath toward the runway centerline. The pilot appeared to have decreased the power setting significantly as the airplane approached the runway.

The video then showed the airplane crossing the runway threshold with the altimeter indicating 1,850 ft msl and the airspeed indicator showing about 100 mph. According to the airplane's Pilot's Operating Handbook (POH), the final approach speed should be 81 mph at the airplane's maximum gross weight. After a hard landing, the airplane entered a series of

bounces that were consistent with porpoising. Each bounce led to an increase in the airplane's pitch angle.

The left-seat pilot stated, "go around," and the pilot applied throttle. The airplane impacted the runway again and entered another bounce. The airspeed indicator showed about 60 mph, and the pilot applied a positive pitch attitude to abort the landing. The airplane pitched nose-up sharply and remained in a nose-high attitude until it impacted a 50-ft-tall tree about 0.5 miles south of the departure end of the runway, where a postcrash fire ensued.

One witness on the ramp near the departure end of the airport reported that, after clearing trees in a low spot near the airport, the airplane continued over a vineyard and then began to pitch up, the left wing dropped, and the nose then dropped toward the ground; the witness identified the airplane as having entered a stall. The witness lost sight of the airplane behind a hill but saw smoke shortly afterward.

All major structural components of the airplane were located within the debris path. Postaccident examination of the airplane found no evidence of a preexisting mechanical anomaly that would have precluded normal operation. At no point during the go-around did the pilot lower the nose to allow the airplane to accelerate, which caused the airplane to exceed its critical angle of attack during the attempted go around and resulted in an aerodynamic stall at an altitude from which recovery was not possible.

Probable Cause and Findings

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

The pilot's exceedance of the airplane's critical angle of attack during an aborted landing after an unstabilized approach and hard landing, which resulted in an aerodynamic stall and impact with trees and terrain. Contributing to the accident was the pilot's decision to continue the unstabilized approach.

Findings

Aircraft	Descent/approach/glide path - Not attained/maintained
Aircraft	Landing flare - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Capability exceeded

Factual Information

History of Flight

Landing-aborted after touchdown	Abnormal runway contact (Defining event)
Initial climb	Abrupt maneuver
Initial climb	Aerodynamic stall/spin
Initial climb	Collision with terr/obj (non-CFIT)

On July 16, 2021, about 0840 Pacific daylight time (PDT), a Beechcraft V35B, N112TW, was destroyed when it was involved in an accident near Angwin Airport-Parrett Field (2O3), Angwin, California. The pilot, pilot-rated passenger, and one passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Radar track data identified the accident airplane departing from French Valley Airport (F70), Murrieta, California, on a climbing southwest heading. The data showed that the airplane made a climbing left turn to the northwest to an altitude of about 9,000 ft msl and continued at that altitude for most of the flight. A little over two hours later, the radar track data showed the airplane descending from 9,000 ft msl as it entered a left downwind for runway 16 at 2O3. The radar track data showed that the airplane made a wide left base turn to final and overshot the final approach. The radar track data then showed the airplane reacquiring the runway heading and landing.

Witnesses at 2O3 reported that the airplane cleared the first tree line at the departure end of the runway. One witness reported that, after clearing the first set of trees, the airplane began to pitch up, the left wing dropped, and the nose then dropped toward the ground. The witness lost sight of the airplane behind a hill but saw smoke shortly afterward.

Pilot Information

Certificate:	Private	**Age:**	73,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 10, 2020
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 2278 hours (Total, all aircraft), 0 hours (Total, this make and model)		

Pilot-rated passenger Information

Certificate:	Private	**Age:**	37,Female
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 1, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 27 hours (Total, all aircraft)		

Passenger Information

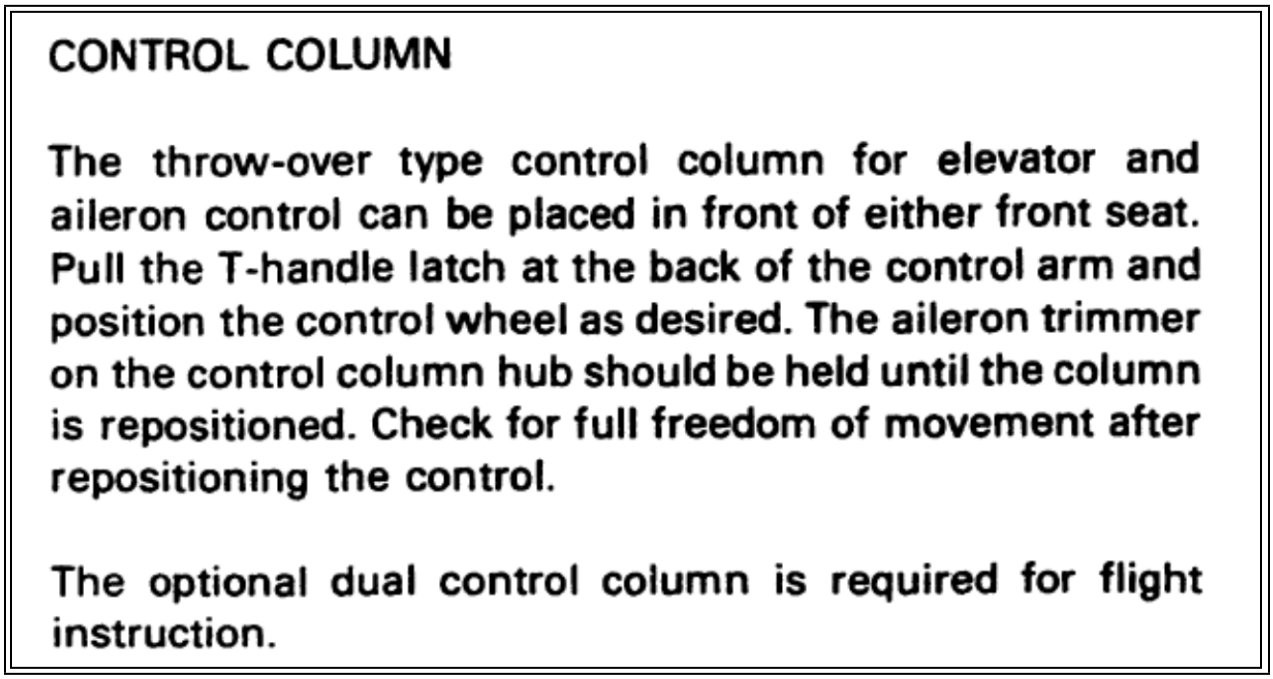
Certificate:		**Age:**	Male
Airplane Rating(s):		**Seat Occupied:**	Rear
Other Aircraft Rating(s):		**Restraint Used:**	Unknown
Instrument Rating(s):		**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

The pilots' logbooks were not recovered during the investigation.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N112TW
Model/Series:	V35	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	D-9523
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Continental Motors
ELT:	Installed	**Engine Model/Series:**	IO-520-BB (10)
Registered Owner:	On file	**Rated Power:**	
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was equipped with a throw-over-type control column for elevator and aileron control. Figure 1 provides the description of the control column in the Beechcraft Bonanza V35, V35A, and V35B POH.



CONTROL COLUMN

The throw-over type control column for elevator and aileron control can be placed in front of either front seat. Pull the T-handle latch at the back of the control arm and position the control wheel as desired. The aileron trimmer on the control column hub should be held until the column is repositioned. Check for full freedom of movement after repositioning the control.

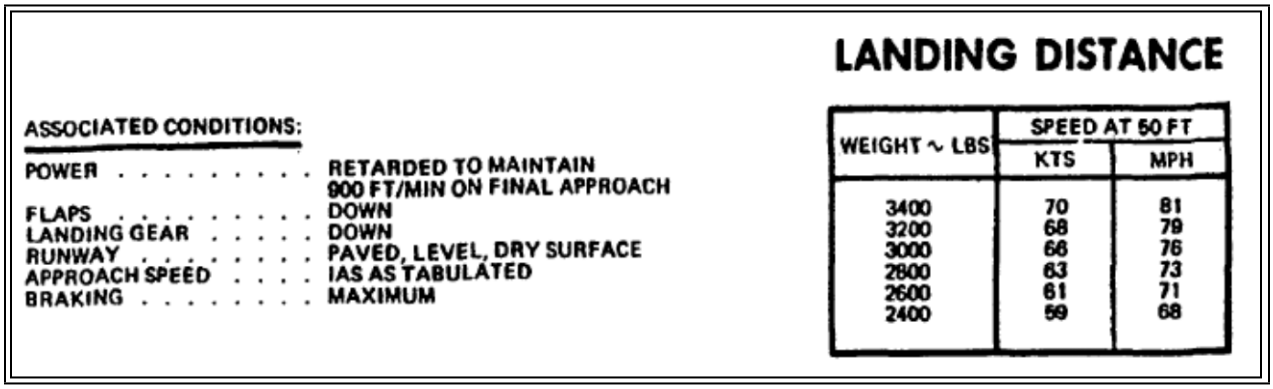
The optional dual control column is required for flight instruction.

Figure 1. Flight control description. (Source: Beechcraft Bonanza V35, V35A, and V35B POH).

According to the POH, the balked landing procedure involved the following steps:

1. *Power – FULL THROTTLE, 2700 RPM*
2. *Airspeed – 70 kts/81 mph until clear of obstacles, then trim to normal climb speed*
3. *Flaps – UP*
4. *Landing Gear – UP*
5. *Cowl Flaps - OPEN*

The POH showed that the final approach speed depended on the weight of the airplane (see figure 2). Due to the postaccident fire, a landing weight could not be established for the accident airplane.



LANDING DISTANCE

ASSOCIATED CONDITIONS:

POWER	RETARDED TO MAINTAIN 900 FT/MIN ON FINAL APPROACH
FLAPS	DOWN
LANDING GEAR	DOWN
RUNWAY	PAVED, LEVEL, DRY SURFACE
APPROACH SPEED	IAS AS TABULATED
BRAKING	MAXIMUM

WEIGHT ~ LBS	SPEED AT 50 FT	
	KTS	MPH
3400	70	81
3200	68	79
3000	66	76
2800	63	73
2600	61	71
2400	59	68

Figure 2. Landing speed information (Source: Beechcraft Bonanza V35, V35A, and V35B POH).

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSTS,114 ft msl	**Distance from Accident Site:**	18 Nautical Miles
Observation Time:	07:53 Local	**Direction from Accident Site:**	258°
Lowest Cloud Condition:	Clear	**Visibility**	7 miles
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.96 inches Hg	**Temperature/Dew Point:**	12°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Temecula, CA (F70)	**Type of Flight Plan Filed:**	None
Destination:	Angwin, CA (2O3)	**Type of Clearance:**	None
Departure Time:	05:51 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	ANGWIN-PARRETT FLD 2O3	**Runway Surface Type:**	Asphalt
Airport Elevation:	1875 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	16/34	**IFR Approach:**	None
Runway Length/Width:	3217 ft / 50 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	38.565647,-122.43043(est)

Examination of the accident site (see figure 3) revealed that the departure end of runway 16 was about 0.5 miles from the first identified point of contact, a 50-ft-tall tree. The airport was not visible from the wreckage site. A portion of wing skin was found in the tree, and the left aileron was found a few feet away on the ground. The main wreckage came to rest about 500 ft downslope of the tree in a vineyard. The left-wing tip tank was found 150 ft west of the main wreckage.

Recorded video showed no evidence of a pre-existing mechanical malfunction that would have precluded normal operation.

Figure 3. Accident site (Source: Napa County Sheriff's Department.)

All four corners of the airplane were accounted for at the accident site. The airframe came to rest on a westerly heading with the engine separated from the firewall. The three-bladed propeller, its spinner, and its hub separated from the engine crankshaft and were located uphill and adjacent to the engine. Flight control continuity was established from the tail to the cockpit and right wing. Continuity could not be established to the left wing because it was destroyed by impact forces and postaccident fire. Numerous separations were noted within the flight control system with signatures consistent with overload separation or thermal damage.

The three propeller blades exhibited s-bending, gouging along the length of the blades, and chordwise scratching. The tips of the propeller blades exhibited gouging, and one blade was missing a portion of its tip.

The crankshaft was manually rotated. Compression was obtained in all cylinders. Gear and valve train continuity was established.

Tests and Research

Postaccident examination of the airplane revealed that a GoPro HERO video recording device was installed on the headliner of the accident airplane and positioned to provide an over-the-shoulder view of the front seats and most of the airplane's instrument panel. The video recording device was sent to the National Transportation Safety Board Vehicle Recorders Division for examination. The examination revealed that the device was damaged by impact and postcrash fire but was otherwise intact. The device's protective outer case was removed, the battery compartment was opened, and the media card was found to be in good condition. The media card was read, and the recorded video files were downloaded. The video recordings also included an associated audio track; all three occupants' voices were recorded.

The recorded video files began about 0557 and recorded the entire flight from the departure airport up until the video concluded after the airplane impacted terrain near 2O3. The recording time totaled about 2 hours 49 minutes.

For most of the cross-country flight, the throw-over control column (yoke) was positioned such that the left-seat pilot (LSP) was flying. For the descent, approach, landing, and go-around attempts, the throw-over yoke was positioned such that the right-seat pilot (RSP) was flying. The flight arrived in the area about 0830; the airport was identified and a descent for landing was initiated from an altitude of about 6,200 ft msl to traffic pattern altitude to 2,725 ft msl. During the descent, the LSP lowered the landing gear and flaps, while the RSP continued to fly the airplane.

The video showed the RSP indicate with his hand in a sweeping motion across the throttle quadrant. There was discussion heard on the audio as to power settings and the RSP was heard to say, "remember, you're on the brakes honey." The LSP stated "yup" and positioned her feet to manipulate the brakes.

As the pilot completed the left base turn, he stated "high" to himself. Moments later, the left base turn rounded into a turn to final. The airplane had entered a left bank of about 30°, the airspeed indicator displayed about 150 mph, the altitude was 3,000 ft msl (1,125 ft agl), and the RSP appeared to add a notch of flaps.

As the airplane rolled onto final, the LSP asked, "all the flaps?" The RSP called short final on the common traffic advisory frequency, and the runway came into view ahead of the airplane. The airplane heading was about 30° right of centerline and tracking toward runway 16. The airspeed indicator displayed a speed of about 135 mph, the altitude was 2,750 ft msl (875 ft agl), and the RSP added nose-up pitch trim and began manipulating the yoke with both hands. About this time, the RSP appeared to reduce manifold pressure to about 15 inches of mercury (inHg).

The RSP manipulated the yoke with both hands while on approach and attempted to correct the airplane toward the runway centerline. The RSP continued to add nose-up pitch trim, the tachometer gauge indicated a value of about 2,300 rpm, the airplane was right of centerline for runway 16, and the airspeed indicator showed about 130 mph. Moments later, the RSP appeared to decrease the airplane's power setting (the gauge indicated less than 15 inHg), and

the engine speed was still above 2,000 rpm. The LSP stated, “gear down.” The RSP appeared to have decreased the power setting significantly as the airplane approached the runway. The airspeed indicator showed 120 mph.

The video showed the airplane cross over the painted “16” on the runway, the altimeter indicated 1,850 ft msl (25 ft below ground level), and the airspeed was about 100 mph. The RSP manipulated the yoke with a two-handed grip as he attempted to round out the airplane just beyond the numbers on the runway. The airplane yawed to the left and then to the right, consistent with the airplane’s directional control not being stabilized. The airplane touched down sharply and violently with an indicated airspeed of about 85 mph. As the airplane touched down, the rear passenger grunted, and both pilots were jostled. The airplane bounced three times consistent with a porpoised landing.
The video showed that each subsequent bounced increased the airplane’s pitch angle. As the airplane bounced a fourth time, the camera was jostled, and the recording became unstable.

The LSP stated, “go around” as the RSP looked down and applied throttle. The manifold pressure showed an increase to about 27 inHg. When the RSP added power, he moved his hand near the other controls in this area, and it was unclear if more than just the throttle was manipulated. Flap indications on the instrument panel were not possible to conclusively resolve. The tachometer showed that the rpm’s were increasing as it passed through 2,000 rpm.

The airplane settled into a brief positive pitch attitude. As the RSP looked down toward the throttle area, the airplane settled back on the runway and the airplane porpoised down the runway. The RSP stated “oh” and looked up and outside, and then back down toward the throttle area. The airspeed indicator showed about 60 mph, when the pilot commanded a positive pitch attitude with the airplane’s nose pitching up sharply. The video showed that the RSP attempted to control the airplane with both hands on the yoke and continued to make pitch changes with a nose-high attitude without lowering the airplane’s nose to allow it to accelerate. The airplane remained in a nose-high attitude but did not climb significantly and subsequently struck trees.

Additional Information

The Federal Aviation Administration's *Airplane Flying Handbook* (FAA-H-8083-3C) stated in part the following about porpoising:

> *In a bounced landing that is improperly recovered, the airplane comes in nose first initiating a series of motions that imitate the jumps and dives of a porpoise. The problem is improper airplane attitude at touchdown, sometimes caused by inattention, not knowing where the ground is, miss-trimming or forcing the airplane onto the runway….*
>
> *Porpoising can also be caused by improper airspeed control. Usually, if an approach is too fast, the airplane floats and the pilot tries to force it on the runway when the airplane still wants to fly….*
>
> *When pilots attempt to correct a severe porpoise with flight control and power inputs, the inputs are often untimely may increase the severity of each successive contact with the surface. These unintentional and increasing pilot-induced oscillations may lead to damage or collapse of the nose gear. When a porpoise is severe, or seems to be getting worse, the safest procedure is to execute a go-around immediately.*

Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye
Additional Participating Persons:	Brook Stewart; Federal Aviation Administration; Sacramento, CA
Original Publish Date:	September 27, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=103492