On July 26, 2017, about 1240 mountain daylight time, a Beech A36TC airplane, N60WB, sustained substantial damage during a forced landing shortly after takeoff from Ogden-Hinckley Airport (OGD), Ogden, Utah. The private pilot, and three passengers were fatally injured. The airplane was registered to Peak 2 Peak, LLC, and was being operated by the pilot as a Title 14 Code of Federal Regulations Part 91 personal flight. Visual meteorological conditions were reported in the area about the time of the accident. A flight plan was not filed for the flight, which was destined for Yellowstone Airport (WYS), West Yellowstone, Montana.

According to the tower controller at OGD, the accident pilot contacted the tower and requested a northwest departure from runway 17. The controller instructed the pilot to enter the left downwind leg of the traffic pattern after departure due to a possible conflict with an inbound helicopter. The controller cleared the airplane for takeoff and it subsequently departed runway 17. When the airplane was about 1/4 mile from the departure end of the runway, the controller cleared the pilot to turn right to the northwest. Less than 1 minute later, the pilot stated, "Hey, I'm going down, zero-whiskey-bravo." The controller cleared the pilot to land, then watched the airplane as it descended and impacted terrain about 1/2 mile from the departure end of runway 17. Another pilot in the area reported seeing the airplane impact the highway.

Two mechanics at OGD heard the accident airplane take off. They stated that the sound was unusual, which made them look up to see what it was. When the airplane first came into view, they stated that it was about 100 ft above the ground and that it should have been about 500 ft or higher at that location, which was about 3,700 ft down runway 17. As the airplane passed by, they noticed that the engine sounded underpowered and that the tail of the airplane was moving up and down as if the pilot was struggling to keep the airplane airborne.

Dashcam video from a car on a southwest-bound street captured the accident airplane in flight. The airplane was first seen flying in a wings-level attitude from the right side of the video frame. As it approached the center of the video frame, it entered a right turn and flew away, paralleling the street. Shortly thereafter, the airplane entered a steep, right, descending turn until out of view.
The pilot, age 48, held a private pilot certificate with ratings for airplane single-engine land and instrument airplane rating. His most recent FAA third-class airman medical certificate was issued on October 22, 2015, with no limitations. The pilot reported no flight experience on the medical application. The pilot's logbook revealed a total of 396 hours of flight experience, which included 196 hours in the accident airplane. In the last 6 months, he had about 28 hours of flight experience, of which about 26 were in the accident airplane.
The airplane was manufactured in 1981 and was equipped with a Continental TSIO-520-NBcUB series engine. The pilot purchased the airplane in May 2014.

A review of maintenance records indicated that the airplane's most recent annual inspection was completed on May 16, 2017, at a tachometer and airframe total time of 3,612.5 hours.

The engine logbook indicated that the engine was overhauled in February 2009. The most recent engine logbook entry was dated May 16, 2016, which indicated that the engine had accrued 493.18 hours since overhaul.

The airplane was equipped with a three-bladed Hartzell PHC-C3YF-1RF propeller. The propeller was installed in February 2005, and the governor was overhauled in February 2009.

Fueling records obtained from OGD revealed that the airplane was serviced with 23.3 gallons of 100LL aviation fuel the morning of the accident flight.

The airplane's co-owner stated that he and the accident pilot bought the airplane 3 years before the accident and that they had no problems with it other than some minor avionics issues. They always refueled with the main fuel tanks to the tabs (60 gallons total, 54 gallons useable) and the wing tip tanks half full (20 gallons total). His reason for the half full tip tanks was to keep the tanks wet, and for managing aircraft weight. He further stated that they had flown the airplane four to six times since the last annual inspection.

The co-owner further reported that their customary procedure was to lean the mixture by four turns of the knob during taxi. During engine runup, they would lean further, and for takeoff, they would adjust the mixture to the full rich position. They always performed takeoffs with the wing flaps retracted. He added that he and the accident pilot sometimes flew together and, during takeoff from runway 17 at OGD, they would use the intersection with runway 3/21 as a visual cue for aborting the takeoff, if the takeoff roll was too long.

Airplane Weight and Balance

The most recent weight and balance record for the airplane was dated April 10, 2015, and indicated that the airplane’s maximum gross weight was 3,650 lbs. The airplane was equipped with a wing tip tank supplemental type certificate (STC), which increased the maximum gross weight to 3,833 lbs.

Despite postimpact fire damage, there was no evidence of any large suitcases, bags or cargo items in the airplane at the time of the accident. Based on the weights of the pilot, passengers, and fuel, and allowing for 40 lbs of baggage, the calculated gross weight of the airplane at the time of the accident was about 3,853 lbs. The actual loading of the airplane at the time of the accident, including baggage weight and location and position of the rear passengers, could not be accurately determined. When the weight data was added to a center of gravity moment worksheet, the airplane’s center of gravity was outside the worksheet’s envelope.

Airplane Takeoff Performance
Takeoff performance distance data for the airplane were presented in graph form in the pilot's operating handbook (POH). The performance chart values were predicated on the following conditions:

- Gross weight: 3,650 lbs
- Power: "Take-off Power Set Before Brake Release"
- Flaps: 0º
- Landing gear retracted after lift-off
- Runway: paved, level, dry surface
- Takeoff speeds: lift off, 74 kts; 50 ft height, 80 kts

POH-derived takeoff distances calculated using the ambient conditions, level runway, 3,650 lb weight, and no wind component were a ground roll distance of 1,900 ft and a distance to clear a 50-ft obstacle of 3,100 ft.

The tip tank STC specified increasing the 3,650-lb takeoff distance values by 11%, which resulted in a ground roll distance of 2,190 ft and distance to clear a 50-ft obstacle of 3,441 ft.

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
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<td>Distance from Accident Site:</td>
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<td>Forecast/Actual:</td>
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<tr>
<td>Departure Time:</td>
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<td>Type of Airspace:</td>
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</table>

The 1153 weather observation at OGD included calm wind, 10 miles visibility, clear skies, temperature 25°C, dew point 14°C, and an altimeter setting of 30.22 inches of mercury. At 1253, wind was from 270° at 5 knots with 10 miles visibility, clear skies, temperature 26°C, dew point 14°C, and an altimeter setting of 30.21 inches of mercury. The density altitude about the time of the accident was about 5,514 ft.
Airport Information

<table>
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<tr>
<th>Airport</th>
<th>OGDEN-HINCKLEY (OGD)</th>
<th>Runway Surface Type</th>
<th>Asphalt</th>
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<td>Runway Surface Condition</td>
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<td>IFR Approach</td>
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<td>Runway Length/Width</td>
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<td>VFR Approach/Landing</td>
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</table>

OGD was equipped with two paved runways, designated 3/21 and 17/35. Runway 17/35 measured 5,195 ft long by 100 ft wide. The airport elevation was 4,472 ft above mean sea level.

Runway 17 had a constant uphill slope of 0.04%. The threshold of runway 17 was at an elevation of about 4,436 ft, and the departure end was at an elevation of about 4,457 ft.

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
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<tr>
<td>Passenger Injuries:</td>
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<td>Ground Injuries:</td>
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<tr>
<td>Total Injuries:</td>
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<td>Latitude, Longitude:</td>
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</table>

The initial impact point was located on the ground near the outer edge of the northbound side of the freeway about 1 mile south of the departure end of runway 17. The airplane came to rest in the median along the center guardrail. The debris field was about 150 ft long with debris in both north- and southbound lanes. (See Figure 1). The main wreckage remained intact and displayed extensive postcrash fire damage. The wing tip tanks and the leading edges of the wings were crushed, consistent with vertical impact damage. All flight controls were accounted for and flight control continuity was confirmed. The propeller assembly separated from the engine during the accident sequence and was subsequently relocated about 200 ft from the debris field after being struck by a passing tractor-trailer. No other vehicles were involved in the accident sequence.
Airframe

The wreckage was relocated to a hangar at OGD for further examination. The rudder and elevator trim tab actuator measurements were unreliable due to impact damage. The left flap actuator indicated about 2° of extension, and the right flap actuator position could not be determined. The fuel system was compromised due to impact and thermal damage. The fuel selector valve was found in the right main tank position. The fuel strainer was disassembled and was free of debris. The tip tanks displayed hydraulic deformation consistent with fuel being present in the tank during impact. No fuel was found during the examination. The landing gear was found in the retracted position. All cabin seats separated from their attach points and were loose in the wreckage.

Engine

The engine was shipped to the Continental Motors facility in Mobile, Alabama, for a teardown
examination. The examination did not reveal any preaccident anomalies with any of the internal engine components. Disassembly of the fuel pump did not reveal any preaccident anomalies that would have precluded normal operation. The fuel pump drive coupling was fractured consistent with impact damage. The propeller governor separated from the engine during the impact sequence and exhibited impact and thermal damage. The internal gears separated from the housing and were undamaged. The propeller governor was disassembled, and the internal flyweights remained intact and capable of normal movement. The turbocharger separated from the engine and exhibited impact and thermal damage. The turbocharger driveshaft was seized and could only be rotated slightly with the use of a wrench. The turbocharger was partially disassembled, and the internal surfaces of the scrolls were not visibly damaged. The turbocharger controller, wastegate, and overboost valve displayed thermal and impact damage. The turbocharger was shipped to Hartzell Engine Technologies, Montgomery, Alabama, for further examination. The examination revealed no anomalies.

Propeller

The propeller assembly did not exhibit any evidence of mechanical malfunctions or anomalies. All damage was consistent with high impact forces and the blade damage was indicative of rotation with engine power at the time of impact.

Medical And Pathological Information

The Utah Department of Health, Office of the Medical Examiner in Taylorsville, Utah, performed an autopsy of the pilot. The cause of death was reported as multiple blunt and thermal injuries.

Toxicology testing performed by the FAA Forensic Sciences Laboratory was negative for drugs, carbon monoxide, and volatiles.

Additional Information

High Density Altitude

The hazards associated with high density altitude operations are outlined in FAA Pamphlet FAA-P-8740-2, Density Altitude. The publication states,

*Whether due to high altitude, high temperature, or both, reduced air density (reported in terms of density altitude) adversely affects aerodynamic performance and decreases the engine's horsepower output. Takeoff distance, power available (in normally aspirated engines), and climb rate are all adversely affected.*
At power settings of less than 75 percent, or at density altitude above 5,000 feet, it is also essential to lean normally-aspirated engines for maximum power on takeoff (unless the aircraft is equipped with an automatic altitude mixture control). Otherwise, the excessively rich mixture is another detriment to overall performance.

According to the FAA Airplane Flying Handbook (FAA-H-8083-3B), "under conditions of high-density altitude, the airplane may be able to become airborne at an insufficient airspeed, but unable to climb out of ground effect. Consequently, the airplane may not be able to clear obstructions."

The FAA Pilot's Operating Handbook (FAA-H-8083-25A) states that,

due to the reduced drag in ground effect, the aircraft may seem capable of takeoff well below the recommended speed. As the aircraft rises out of ground effect with a deficiency of speed, the greater induced drag may result in marginal initial climb performance. In extreme conditions, such as...high density altitude...a deficiency of airspeed during takeoff may permit the aircraft to become airborne but be incapable of sustaining flight out of ground effect.

Weight and Balance

According to the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B), compliance with the weight and balance limits of any aircraft is critical to flight safety. Operating above the maximum weight limitation compromises the structural integrity of an aircraft and adversely affects its performance. Operation with the CG outside approved limits will result in control difficulty.

Balance refers to the location of the CG of an aircraft and is important to stability and safety in flight. The CG is a point at which the aircraft would balance if it were suspended at that point.

The primary concern in balancing an aircraft is the fore and aft location of the CG along the longitudinal axis. The CG is not necessarily a fixed point; its location depends on the distribution of weight in the aircraft. As variable load items are shifted or expended, there is a resultant shift in CG location. The distance between the forward and back limits for the position of the center for gravity or CG range is certified for an aircraft by the manufacturer. The pilot should realize that if the CG is displaced too far forward on the longitudinal axis, a nose-heavy condition will result.

Loading in a nose-heavy condition causes problems in controlling and raising the nose, especially during takeoff and landing. The pilot's natural correction for longitudinal unbalance is a change of trim to remove the excessive control pressure. Excessive trim, however, has the effect of reducing not only aerodynamic efficiency but also primary control travel distance in the direction the trim is applied.

Limits for the location of the CG are established by the manufacturer. These are the fore and aft limits beyond which the CG should not be located for flight. These limits are published for each aircraft in the Type Certificate Data Sheet (TCDS), or aircraft specification and the AFM or POH. If the CG is not within the allowable limits after loading, it will be necessary to relocate some items before flight is attempted. The forward CG limit is often established at a location
that is determined by the landing characteristics of an aircraft. During landing, one of the most critical phases of flight, exceeding the forward CG limit may result in excessive loads on the nosewheel, a tendency to nose over on tailwheel type airplanes, decreased performance, higher stalling speeds, and higher control forces.

In extreme cases, a CG location that is beyond the forward limit may result in nose heaviness, making it difficult or impossible to flare for landing.

The publication also cautioned that it is possible to load some aircraft in such a manner that they will be out of CG limits even though the useful load has not been exceeded. Because of the effects of an out-of-balance or overweight condition, a pilot should always be sure that an aircraft is properly loaded.

Regulatory Guidance

14 CFR Part 23 requires establishment of the ranges of weights and CGs within which an aircraft may be operated safely. The manufacturer provides this information, which is included in the AFM, type certificate data sheets, or aircraft specifications.

While there are no specified requirements for a pilot operating under 14 CFR Part 91 to conduct weight and balance calculations prior to each flight, 14 CFR Part 91, requires the pilot in command to comply with the operating limits in the approved AFM. These limits include the weight and balance of the aircraft. To enable pilots to make weight and balance computations, charts and graphs are provided in the approved AFM.

**Administrative Information**

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>Andrew L Swick</th>
</tr>
</thead>
</table>
| Additional Participating Persons: | Mark Rushton; FAA-FSDO; Salt Lake City, UT  
Andrew Hall; Textron Aviation; Wichita, KS  
Nicole Charnon; Continental Motors; Mobile, AL  
Les Doud; Hartzell Propellers; Piqua, OH |
| Note: | The NTSB traveled to the scene of this accident. |
| Investigation Docket: | [http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=95667](http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=95667) |