Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A15P0147

ENGINE POWER LOSS AND FORCED LANDING
BEECHCRAFT A36, C-GPDK
OSOYOOS, BRITISH COLUMBIA
07 JULY 2015

Canada

Transportation Safety Board of Canada
Place du Centre
200 Promenade du Portage, 4th floor
Gatineau QC K1A 1K8
819-994-3741
1-800-387-3557
www.tsb.gc.ca
communications@bst-tsb.gc.ca

Aviation Investigation Report A15P0147

Cat. No. TU3-5/15-0147E-PDF
ISBN 978-0-660-06640-0

This report is available on the website of the
Transportation Safety Board of Canada at www.tsb.gc.ca

Le présent rapport est également disponible en français.

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report A15P0147

Engine power loss and forced landing
Beechcraft A36, C-GPDK
Osoyoos, British Columbia
07 July 2015

Summary

On 07 July 2015, at approximately 1645 Pacific Daylight Time, a privately operated Beechcraft A36 Bonanza (registration C-GPDK, serial number E-1728) departed the Oliver Airport, British Columbia, with only the pilot on board for a flight to the Boundary Bay Airport, British Columbia. Approximately 6 minutes after takeoff, the aircraft suffered an engine power loss, and the pilot carried out a forced landing on Highway 97. The aircraft struck a truck and a power pole, and came to rest on the edge of the road. The pilot was able to egress, but sustained serious burns. A post-impact fire consumed most of the aircraft. The accident occurred 0.27 nautical miles northeast of the Osoyoos Airport, British Columbia, at a ground elevation of 1035 feet above sea level, during daylight hours. There was no signal transmitted from the emergency locator transmitter.

Le présent rapport est également disponible en français.

Factual information

History of the flight

On 30 June 2015, the pilot had flown from the Boundary Bay Airport (CZBB) to the Oliver Airport (CAU3), British Columbia. During that flight, the pilot had noted engine anomalies, and had captured on his cellular phone video images of the instrument panel display showing fluctuations in engine fuel flow and engine revolutions per minute (rpm). The pilot sent the videos by text message to the aircraft maintenance engineer (AME) who had been maintaining the aircraft.

The videos showed that the fuel flow had been fluctuating by approximately 10 pounds per square inch (psi), with a corresponding fluctuation in engine speed of 25 rpm. In an exchange with the pilot by text message, the AME suggested that the fuel flow and engine rpm fluctuations may have been caused by a dirty fuel nozzle or vapour lock from the use of automotive gasoline (MOGAS).[1] The flight continued to CAU3 without any appreciable power loss. While in Oliver, no maintenance was carried out to address the engine defects, and the aircraft remained in an outdoor parking area at CAU3 from 30 June until 07 July, the day of the occurrence. During those 8 days, the daily high temperature was 34°C to 38°C.

On 07 July at 1532,[2] the pilot filed a visual flight rules (VFR) flight plan with the Kamloops Flight Information Centre (FIC), with a planned altitude of 10 500 feet above sea level (asl). The CAU3 fuel transaction log showed that the pilot made a fuel purchase of 57 litres of 100LL aviation fuel (AVGAS) at 1608. The aircraft departed CAU3 at approximately 1640 in a southbound direction (Figure 1).

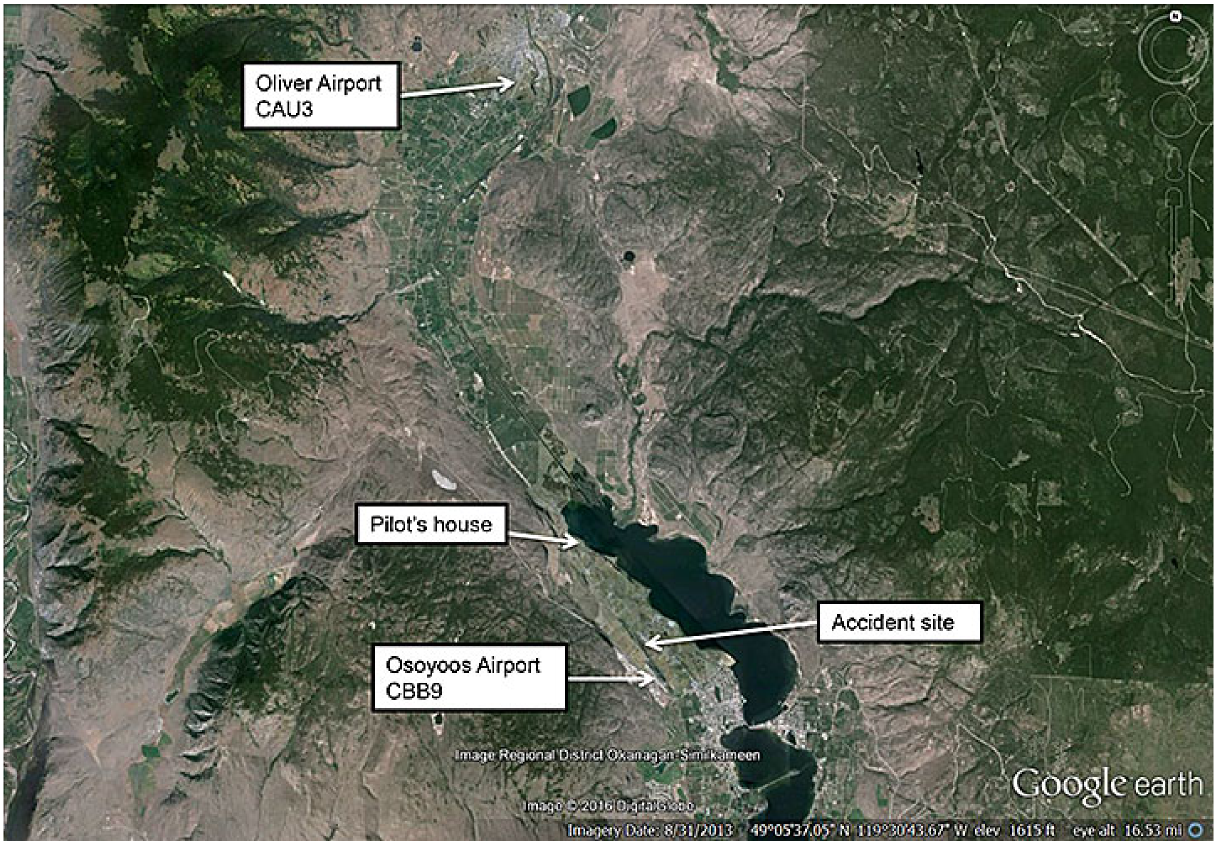
Minutes later, as the aircraft was climbing through 6000 feet asl, the engine lost power. The pilot attempted to restart the engine 3 times, twice with the auxiliary pump on and once without the auxilary pump. There was no change in engine power. Unable to reach Osoyoos Airport (CBB9) to carry out an emergency landing, the pilot attempted to land on Highway 97. The aircraft was southbound when the left wing struck a commercial semi-trailer truck. The driver of the truck was not injured, and there was minor damage on the left rear of the trailer. The aircraft then collided with the road surface, and a fire erupted before the aircraft came to rest against a power pole beside the road. The Royal Canadian Mounted Police (RCMP) received notification of the accident at 1655.

---

1 Transport Canada, TP 10737, *The Use of Automobile Gasoline (MOGAS) in Aviation*, Amendment 2 (31 March 1993), Section 1.0.

2 All times are Pacific Daylight Time (Coordinated Universal Time minus 7 hours).

Figure 1. Aerial view of the general flight area (Source: Google Earth, with annotations by TSB)



Wreckage and accident site examination

Investigators examined the accident site and the aircraft wreckage (Photo 1) in Osoyoos on 08 July.

Impact damage on the highway surface indicated that the nose wheel of the aircraft made the first ground contact, approximately 275 feet after striking the semi-trailer. This evidence is consistent with the aircraft being in a steep nose-down attitude. Upon impact, the nose wheel, including a part of the shock strut fork, separated from the aircraft. The nose wheel was found approximately 100 feet north of the point where the aircraft came to a rest. The separation of the nose wheel caused the propeller to strike the road surface, leaving 3 ground scars. These ground scars and the propeller damage are consistent with the aircraft's engine rotating at a slow speed on impact. The right wing-tip tank separated from the wing and was found on the west side of Highway 97, approximately 40 feet north of the wreckage. The aircraft struck the power pole at the most inboard portion of the leading edge of the left wing. The forward two-thirds of the fuselage and most of the left wing were destroyed by the fire. There was only minor fire damage to the right wing.

Due to the extent of fire damage, examination of the aircraft was limited, and focused on the engine and fuel system, including the wings and tip tanks. The right wing was damaged at the inboard point of attachment to the fuselage, but the area containing fuel was largely undamaged. The interior of the fuel tank was examined; however, there was no remaining fuel. Both tip tanks were empty, but emitted a strong odour of MOGAS.[3] The fuel selector valve was found pointing to the right-hand tank, and the fuel selector valve filter/screen did not contain contaminants. The engine was removed and examined at an engine overhaul facility. It was completely disassembled, and all parts were examined for pre-impact and pre-fire anomalies. There were no indications of engine problems or defects that could have led to a loss of engine power.

It was not determined why the emergency locator transmitter (ELT) did not transmit an emergency signal.

Photo 1. Accident site showing the aircraft wreckage (Source: Keremeos RCMP Integrated Collision Analysis and Reconstruction Service [ICARS])

Aircraft

General

The aircraft was manufactured in 1981, and purchased by the pilot in June 2010. Records indicate that the annual maintenance inspection had recently been completed, and the aircraft was certified, equipped, and maintained in accordance with existing regulations.

---

3 According to Hess Material Safety Data Sheet (MSDS), gasoline (all grades) has a "strong, characteristic aromatic hydrocarbon odor" that is "[s]weet-ether like" and is detectable at a lower concentration than non-oxygenated gasoline [i.e., AVGAS].

Power plant

The aircraft was equipped with a Teledyne Continental Motors model IO-520-BB fuel injected, direct-drive, air-cooled, horizontally-opposed 6-cylinder engine. In April 1997, the engine was overhauled in preparation for the addition of a supplemental type certificate (STC) turbocharging system. Approximately 1 month (37 hours of flight time) later, a Tornado Alley Inc. turbonormalizing and GAMI fuel injection system was installed.

This type of system maintains the original Beechcraft fuel requirement. It does not increase the overall power output of the engine; rather, it is used to maintain sea level manifold pressure (roughly 30 inches of mercury) at higher altitudes. By eliminating the progressive horsepower reduction that occurs with normally aspirated engines as the aircraft climbs, the turbonormalizing system reduces the time required to climb to a specific altitude.[4]

Fuel system

The aircraft was designed for operation on grade 100LL (blue) or 100 (green) AVGAS. The airframe fuel system consists of the following components: 4 fuel tanks, a fuel quantity indicating system, an auxiliary fuel pump, a fuel tank selector (with integrated fuel strainer and drain), and the associated fuel lines to the engine compartment. The fuel tanks consist of a rubber fuel cell and a sump located on the underside of each wing. The auxiliary fuel pump is electric and is located between the fuel selector valve and the engine-driven injector pump. The pump is controlled by an on/off switch, and provides pressure for starting and emergencies. The pump can purge the system of vapour caused by extremely high ambient temperature and reduce the chance of the fuel vaporizing. It can also provide pressure to the engine should the engine-driven injector pump fail.

The engine fuel distribution system was removed in 2011, about 76 flight hours prior to the accident, for troubleshooting. It was tested, and no anomilies were found.

Pilot's operating handbook and airplane flight manual

In its emergency procedures section regarding loss of engine power, the Beechcraft *Pilot 's Operating Handbook and Airplane Flight Manual* (POH/AFM) states the following:

1. Fuel Flow Gage - CHECK

If fuel flow is abnormally low:

   a. Mixture - FULL RICH
   b. Auxiliary fuel pump - ON (then OFF if performance does not improve in a few moments)

2. Fuel quantity indicator - CHECK for fuel supply in tank being used.

If tank being used is empty:

[4] David F. Rogers, *Turbo-normalization* (1996–1999).

Fuel Tank Selector Valve - SELECT OTHER FUEL TANK (feel for detent).[5]

In its emergency procedures section regarding engine failure after liftoff and in flight, the Beechcraft POH/AFM states the following:

> *Landing straight ahead is usually advisable. If sufficient altitude is available for maneuvering, accomplish the following:*
>
> 1. Fuel Selector Valve – SELECT OTHER TANK (feel for detent)
> 2. Auxilary Fuel Pump – ON
> 3. Mixture – FULL RICH, then LEAN AS REQUIRED
> 4. Magnetos – CHECK LEFT, RIGHT, THEN BOTH
>
> NOTE
>
> The most probable cause of engine failure would be loss of fuel flow or improper functioning of the ignition system.[6]

The *Airplane Flight Manual Supplement* (AFMS) for the Tornado Alley Turbo STC does not provide any performance charts; however, improved performance can be expected at density altitudes where the turbo maintains sea level power. The AFMS does not specifically address an engine power loss. Under its Emergency Procedures section heading, it states "No change."

Neither the Beechcraft POH/AFM nor the Tornado Alley Turbo AFMS address fuel vapour lock during climb. However, the Tornado Alley website issues the following caution:

> Should you notice that the TIT [*turbine inlet temperature*] is rising unexpectedly, or that the fuel flow needle is "wiggling" (or for any other reason you have an inadequate fuel flow) you should assume you have an actual or incipient vapor lock. In this instance, turn the boost pump to ON/HIGH (depending upon the particular system). If, for any reason, you are unable to obtain adequate fuel flow, do not hesitate to use the LOW or even the HIGH boost pump position. After the climb is complete, you should return the boost pump to the OFF or LOW position, and re-lean the mixture for cruise as described elsewhere.[7]

---

5 Beechcraft Corporation, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for the Beechcraft Bonanza A36* (Serials E-927 thru E-2110, except E-1946 and E-2104) (Issued October 1976, revised July 1994), p. 3-5.

6 Ibid., p. 3-4.

7 Tornado Alley Turbo, Inc., Suggestions Concerning the Operation of the Turbonormalized (TN) IO-520/550 Equipped with the Tornado Alley Turbo, Inc., "Whirlwind System III" (revised 27 October 2014), available at http://www.taturbo.com/turbooperation.html (last accessed on 30 September 2016).

In its emergency procedures section under Maximum Glide Configuration, the Beechcraft POH/AFM states the following:

> 1. Landing gear - UP
> 2. Flaps - UP
> 3. Cowl Flaps - CLOSED
> 4. Propeller - PULL for LOW RPM
> 5. Airspeed - 110 KTS
>
> Glide distance is approximately 1.7 nautical miles (2 statute miles) per 1000 feet of altitude above the terrain.[8]

The engine power loss occurred at approximately 6000 feet asl (5000 feet above ground level [agl]). This altitude should have allowed the aircraft to glide a total of 8.5 nautical miles (nm) (Appendix A). The Osoyoos Airport is at an elevation of 1100 feet asl and is approximately 7 nm from the estimated location of the engine power loss. The accident location was 0.27 nm from the Osoyoos Airport.

Pilot

Records indicate that the pilot held a private pilot licence for aeroplanes, validated with a current medical certificate. He had been licensed since April 1997 and had accumulated approximately 490 hours of flying time. His previous aircraft had been a 1974 Cessna 182P Skylane, which he owned and flew from April 2001 to July 2011. In the previous year, he had flown 12 hours in the Beech A36, and had made the same trip from Boundary Bay, where he stored his aircraft, to CAU3 and return numerous times.

Weather

The closest aviation weather-reporting location to CAU3 is the Penticton Airport (CYYF), 22 nm north of the accident site. The 1600 (2300Z) METAR (aviation routine weather report) for the station stated: wind 020° True (T) at 12 knots, visibility 15 statute miles (sm) in smoke, few clouds at 7500 feet agl, temperature 35°C, dew point 9°C, and altimeter 29.82 inches of mercury.

The METAR for CYYF also reported a density altitude of 3700 feet, which is recorded at an airport elevation of 1130 feet. Using values of 25°C and 6000 feet, the approximate density altitude at the time the pilot experienced engine power loss was 8700 feet.

---

8 Beechcraft Corporation, *Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for the Beechcraft Bonanza A36* (Serials E-927 thru E-2110, except E-1945 and E-2104) (Issued October 1976, revised July 1994), p. 3-6 to 3-7.

Fuel

The investigation determined that the pilot/owner had been using MOGAS, and there was a strong odour of MOGAS in the tip tanks. However, the last record of fuel for the aircraft was at CAU3, where there is a self-service 100LL AVGAS distribution system. Records showed that that fuel had been certified for fuel density and that clear and bright tests were completed. There were no reported issues with the CAU3 fuel.

Automotive gasoline

The Transport Canada (TC) publication (TP 14371) *Aeronautical Information Manual* (AIM) is introduced to aviators during initial flight training and provides guidance on the use of MOGAS. AIM section 1.3.1 Fuel Grades states "The use of aviation fuel other than specified is contrary to a condition of the Certificate of Airworthiness and, therefore, a contravention of regulations. A fuel which does not meet the specifications recommended for the aircraft may seriously damage the engine and result in an in-flight failure."[9] The note section of AIM 1.3.1 references Transport Canada publication TP 10737 *The Use of Automobile Gasoline (MOGAS) in Aviation*. TP 10737 provides guidance on the use of MOGAS as an alternative to AVGAS for owner/operators of Canadian registered piston-powered aircraft. The document specifies the types of certified aircraft eligible to use MOGAS and the operational considerations associated with its use. Vapour lock and the volatility classes of MOGAS are also addressed. The document states:

> Due to the higher volatility of Mogas as compared to Avgas, the margin of safety in conditions conductive to vapour lock will be less with Mogas. […] Engine running characteristics consistent with an interrupted fuel supply and roughness similar to running too lean would be signs of vapour lock in flight. […] Being aware of the higher volatility of Mogas as compared to Avgas is only part of the issue. A prime difference between the two is that Canadian Mogas is available to the consumer in 4 seasonal grades, each with different limits on vapour pressure, whereas Avgas has a single limit year round. <u>The most serious implication to the Mogas pilot is that it is possible to obtain fuel from the volatility class of the previous season, as would be the case on a warm spring day fueled with a high volatility winter class fuel</u>.[10]
>
> [Emphasis in original]

C-GPDK had accumulated 12 hours of flight between June 2014 and June 2015. The purchase date and type of MOGAS used in C-GPDK could not be determined. TP 10737 explains that the United States (US) Federal Aviation Administration (FAA) allows the use of MOGAS

---

9 Transport Canada, TP 14371E, *Aeronautical Information Manual* (31 March 2016), Section 1.3.1, p. 383.

10 Transport Canada, TP 10737, *The Use of Automobile Gasoline (MOGAS) in Aviation*, Amendment 2 (31 March 1993), Sections 3.3 and 3.4.

through the approval of STCs. There is currently no approval in Canada or the US for the use of MOGAS in a Beechcraft A36 Bonanza.

In July 1987, Beechcraft released a Safety Communique covering piston powered aircraft titled, "Use of Automobile Type Gasoline in Beech Aircraft." The document details issues related to the use of automotive gasoline in aircraft certified for aviation gasoline. This includes information concerning vapour pressure and vapour lock. The document also carries a warning that states, "Do not use autogas in Beech airplanes which are certified for aviation gasoline."[11]

Vapour lock

Vapour lock occurs when fuel, normally in liquid form, changes to vapour while still in the fuel delivery system. This change causes a reduction in pressure to the engine-driven fuel pump and disruption of fuel flow to the fuel injection system. It can result in transient or complete loss of engine power. An aircraft engine is more likely to undergo vapour lock with increased temperatures, lowered pressures (density altitude), higher Reid vapour pressure (RVP) of the fuel, or a combination of any of these factors.

The RVP is widely used as an indicator of volatility of petroleum products. RVP is a value expressed as the pressure exerted where the fuel begins to undergo transition from liquid to vapour when the fuel is held at 100°F (38°C). AVGAS 100LL is manufactured to American Society for Testing and Materials (ASTM) standards, which stipulate that its RVP must be between 38 KPa and 49 KPa (5.5–7.1 psi). Its RVP is significantly lower than that of automotive gasoline, in which the vapour pressure can vary between 48 KPa in summer to 103 KPa in winter (7–15 psi). Because AVGAS has a lower and more uniform vapour pressure than automotive gasoline does, it will remain in the liquid state at a higher ambient temperature during reduced atmospheric pressure at high altitude.

The FAA Technical Center produced a report titled *Autogas in General Aviation Aircraft*.[12] The report details a series of tests that the Center had conducted on aircraft piston engines to compare MOGAS with AVGAS and to examine their tendency to cause vapour lock. For some of the tests, the fuel system was modified to simulate a suction feed system, and the engine fuel system was also converted to a fuel injection type (i.e., the type of system found on a Beechcraft A36).

When the results were compared with identical conditions in a carbureted engine, it was noted that vapour lock occurred sooner with the fuel injected engine. During a test sequence, the boost pump was left off, except for recovery from vapour lock. More often than not, the electric boost pump was required to recover from a vapour lock sequence in the fuel injected

---

[11] Beechcraft Corporation, Safety Communique, SUBJECT: Use of Automobile Type Gasoline in Beech Aircraft (July 1987), p. 2.

[12] Federal Aviation Administration (FAA) Technical Center, *Autogas in General Aviation Aircraft* (March 1987).

engine. A test sequence was also conducted to demonstrate that the 43°C initial tank temperature and the takeoff fuel flow were the worst case for a generic suction feed (low wing) fuel system. The test determined that takeoff and climb power settings resulted in the most fuel turbulence and high engine compartment temperatures. Also, lower atmospheric pressure, as the aircraft continued to climb, increased the probability of vapour lock.

Post-impact fire

The post-impact fire started prior to the aircraft's collision with the power pole, and the aircraft was engulfed by fire only seconds after impact. The ignition source of the fire is unknown. Possible ignition sources included fuel contact with hot engine parts, sparks created from metal contact (separation of the nose landing-gear wheel) with the road surface, and electrical arcing. The battery of the Beech A36 is located in the engine compartment and as such, could also have been an ignition source in the occurrence.

Previously identified post-crash fire issues

Post-impact fires have been documented as a risk to aviation safety in previous TSB investigation reports, as well as in the 2006 *TSB Safety Study –Post-impact fires resulting from small-aircraft accidents (SII A05-11)*. These reports concluded that there are a large number of small aircraft in service, and the defences against post-impact fires in impact-survivable accidents involving these aircraft are, and will remain, inadequate unless countermeasures are introduced to reduce the risk.

The most effective ways to prevent post-impact fires in accidents involving existing small aircraft are to eliminate potential ignition sources, such as hot items, high-temperature electrical arcing and friction sparking, and to prevent fuel spillage by preserving fuel-system integrity in survivable crash conditions. Technology that is known to reduce the incidence of post-impact fires by preventing ignition and containing fuel in crash conditions may be selectively retrofitted to existing small aircraft, including helicopters certified before 1994. Therefore, in Recommendation A06-10, issued 29 August 2006, the Board recommended that,

> To reduce the number of post-impact fires in impact-survivable accidents involving existing production aircraft weighing less than 5700 kg, Transport Canada, the Federal Aviation Administration, and other foreign regulators conduct risk assessments to determine the feasibility of retrofitting aircraft with the following:
>
> - selected technology to eliminate hot items as a potential ignition source;
> - technology designed to inert the battery and electrical systems at impact to eliminate high-temperature electrical arcing as a potential ignition source;
> - protective or sacrificial insulating materials in locations that are vulnerable to friction heating and sparking during accidents to eliminate friction sparking as a potential ignition source; and
> - selected fuel system crashworthiness components that retain fuel.
>
> **TSB Recommendation A06-10**

TC responded to these recommendations, but because its responses contained no action or proposed action that would reduce or eliminate the risks associated with this deficiency, TC's overall response to Recommendation A06-10 was assessed as Unsatisfactory.[13]

A similar study was conducted in the US by the National Transportation Safety Board (NTSB)[14] in 1980, leading to NTSB Safety Recommendations A-80-90 to A-80-95. The status of 4 of those 5 recommendations is now listed as "Closed—Unacceptable Action." The only recommendation listed as "Closed—Acceptable Action" is A-80-094, which states:

> The NTSB recommends that the Federal Aviation Administration: Assess the feasibility of requiring the installation of selected crash resistant fuel system components, made available in kit form from manufacturers, in existing general aviation aircraft on a retrofit basis and promulgate appropriate regulations.[15]

The FAA started the rule-making process to introduce standards for fuel fittings; however, the process was stopped based on the results of a cost-benefit analysis.

Pilot decision making

TC's TP 13897, *Pilot Decision Making*, is divided into 5 modules: introduction, the decision-making process, human performance factors, human error, and risk management. The decision-making process typically follows 4 steps: gathering information, processing information, making decisions, and taking action on those decisions. TP 13897 describes the risks that exist during information gathering and the processing of this information. If a pilot uses incorrect information in the decision-making process, it is likely that the pilot will make an ineffective decision. In an emergency situation, there is also a risk that the pilot may have to switch rapidly between tasks that need to be handled simultaneously, thereby focusing too much attention on one task while neglecting another. Furthermore, a pilot's prior training and experience will influence the decisions made, because the pilot is likely to use procedures that have worked previously.

The investigation determined that the pilot had experienced fuel-flow fluctuations and power losses on previous flights with C-GPDK, but, on those occasions, was able to successfully regain normal power and engine operation. The pilot had accomplished this by manipulating the fuel mixture control. There was no information to indicate that the pilot followed the emergency procedures section of the Beechcraft POH/AFM correctly, on those

---

13 Transportation Safety Board of Canada, Recommendation A06-10, Reassessment of response to Aviation Safety Recommendation A06-10 (March 2016), available at http://www.tsb.gc.ca/eng/recommandations-recommendations/aviation/2006/rec_a0610.asp (last accessed on 22 October 2016).

14 United States National Transportation Safety Board (NTSB), Special Study Report NTSB-AAS-80-2, *General Aviation Accidents: Postcrash Fires and How to Prevent or Control Them* (1980).

15 National Transportation Safety Board, Safety Recommendation A-80-094.

occurrences or the accident flight, to regain normal engine operation. Maintenance and troubleshooting after the previous occurrences revealed no anomalies.

Analysis

No mechanical issues that would have resulted in an engine power loss were identified during the investigation. Therefore, the analysis will focus on the fuel type used, the fuel flow, the aircraft emergency procedures, and the pilot's decision making.

It could not be determined what type of fuel was being fed to the engine at the time of the power loss. However, since the pilot had a history of using automotive gasoline (MOGAS) and the aircraft tip tanks emitted a strong odour of MOGAS, it is likely that there was a mixture of aviation fuel (AVGAS) and MOGAS in the aircraft fuel tanks. While the possibility of vapour lock is increased with use of MOGAS, it may also have occurred with AVGAS because the aircraft climb performance allowed it to climb to a higher density altitude (8700 feet) while the fuel temperature remained high.

If MOGAS is used in aircraft that are not certified for its use, there is an increased risk of engine power loss due to fuel delivery issues such as vapour lock. The cellular phone video shows that the pilot had been experiencing fluctuations in engine fuel-flow and engine rpm that were consistent with vapour lock. In the absence of mechanical issues, it is likely that the aircraft's engine was starved of fuel due to a vapour lock, and lost power as a result.

In the event of a power loss or engine failure, the Beechcraft *Pilot's Operating Handbook and Airplane Flight Manual* (POH/AFM) directs the pilot to turn on the boost pump and adjust the mixture to full rich; however, the pilot had previously regained full power by adjusting the fuel mixture only. Furthermore, the Tornado Alley website suggests that with an actual or incipient vapour lock, the pilot should turn on the boost pump, then after the climb is complete, return the boost pump to off and re-lean the mixture.

The engine power loss occurred at approximately 6000 feet above sea level (asl) (5000 feet above ground level [agl]). This altitude should have allowed the aircraft to glide a total of 8.5 nautical miles (nm) (Appendix A). The Osoyoos Airport is at an elevation of 1100 feet asl and is about 7 nm from the estimated location of the engine power loss. The pilot's previous success in regaining full engine power may have delayed selection of a forced landing area. The nearest airport was then not an option, and Highway 97 was chosen as the next best emergency landing area.

During the forced landing on the highway, the aircraft struck a truck, then a pole; a post-crash fire ensued, caused by spilled fuel igniting.

The pilot's injuries consisted of serious burns caused by the post-impact fire. C-GPDK did not have, nor was required to have, any of the technologies, materials, or components recommended in TSB Recommendation A06-10. If aircraft are not fitted with crashworthy fuel-system components that retain fuel or with systems that eliminate ignition sources, the risk of injury or death due to post-impact fire is increased.

Findings

Findings as to causes and contributing factors

1. It is likely that the aircraft's engine was starved of fuel due to vapour lock, and lost power as a result.

2. The pilot's previous success in regaining full engine power may have delayed selection of a forced landing area. The nearest airport was then not an option, and Highway 97 was chosen as the next best emergency landing area.

3. During the forced landing on the highway, the aircraft struck a truck, then a pole; a post-crash fire ensued, caused by spilled fuel igniting.

Findings as to risk

1. If automotive gasoline is used in aircraft that are not certified for its use, there is an increased risk of engine power loss due to fuel delivery issues such as vapour lock.

2. If aircraft are not fitted with crashworthy fuel-system components that retain fuel or with systems that eliminate ignition sources, the risk of injury or death due to post-impact fire is increased.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 13 October 2016. It was officially released on 03 November 2016.

Visit the Transportation Safety Board's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

Appendix A – Glide performance