



Aviation Investigation Final Report

Location:	Kernville, California	Accident Number:	WPR18LA278
Date & Time:	September 30, 2018, 08:44 Local	Registration:	N9471H
Aircraft:	Howard DGA 15P	Aircraft Damage:	Destroyed
Defining Event:	Fuel starvation	Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Before departure, the pilot selected the main fuel tank, performed an engine run-up and then taxied to the runway. During his subsequent takeoff attempt, the airplane lifted off the ground and transitioned into a climb. As the airplane reached about 50 ft above ground level, the pilot experienced a total loss of engine power. The airplane descended rapidly and impacted the runway, which resulted in a postcrash fire and destroyed most of the airplane except for the engine compartment.

Information provided by the airplane type certificate holder indicated that takeoffs were conventionally conducted with the front fuel tank selected for takeoff rather than the main fuel tank. The accident airplane's operating handbook indicated that takeoff should be conducted with the main tank selected, but documentation indicated that the manufacturer later published guidance requiring takeoffs with the front fuel tank selected due to an unspecified fuel system failure, believed to be the result of a fuel tank un-porting. There was no available information to indicate that this guidance was distributed to the operators of earlier serial number airplanes. The type certificate holder also published anecdotes from pilots who had experienced a loss of engine power during takeoff with the main fuel tank selected when the tank was less than 1/2 full. The accident pilot reported that the main fuel tank may have been less than 3/8 full at the time of the accident.

Examination of the airplane and an engine test run did not reveal any preimpact mechanical anomalies that could have resulted in a loss of power. Given the available information, it is likely that the engine experienced fuel starvation, which resulted in a total loss of engine power.

Probable Cause and Findings

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

A total loss of engine power during initial climb due to fuel starvation.

Findings

Aircraft	Fuel selector/shutoff valve - Incorrect use/operation
Aircraft	Fuel - Not specified

Factual Information

History of Flight

Initial climb	Fuel starvation (Defining event)
Initial climb	Collision with terr/obj (non-CFIT)

On September 30, 2018, about 0844 Pacific daylight time, a Howard Aircraft DGA-15P, N9471H, was destroyed when it was involved in an accident near Kernville, California. The airline transport pilot and passenger were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he was returning home after attending a fly-in event. After waiting for the engine oil to warm up to 60°C, he performed the engine run-up. During this time, he checked the rpm drop between magnetos, verified that the carburetor heat functioned normally, and cycled the propeller. After completing the run-up checklist, the pilot selected the main fuel tank, which was about 3/8 full. The forward tank was about half full. He then waited about 10 minutes for the traffic pattern to clear before departing. The airplane lifted off the runway at about 70 mph and accelerated to about 85 mph in a 10° nose high attitude. The airplane reached about 50 ft above ground level (agl) before the engine lost total power and the airplane started to descend rapidly. After impacting the runway, both main landing gear separated, and the airplane slid about 300 ft before coming to rest upright. The airplane was destroyed by postcrash fire; however, the engine compartment survived the fire with minimal thermal damage. In a subsequent statement, the pilot reported that the main fuel tank may have been less than 3/8 full, as he had recently flown 1.5 hours.

According to FAA records, the airplane was manufactured in 1943 and registered to the pilot on January 6, 2016. The airplane was powered by a Pratt & Whitney R-985 AN-14B, air cooled, 450 horsepower radial engine. Maintenance records indicated that the airplane's most recent annual inspection was completed on April 26, 2018, at a total time of 2,208 flight hours. The engine had accrued a total of 5,683 total hours at the time of the inspection and 508 hours since its most recent overhaul, which was completed on January 8, 1996. A maintenance record from June 2018 showed that the pistons for cylinder Nos. 3 and 5 were removed and reinstalled to facilitate the installation of new piston rings.

The engine was test run for 10 minutes at 1,000 rpm and subsequently advanced 200 rpm every 10 minutes. During the 15-minute engine run at 1,800 rpm, the left and right magnetos were shut down individually, which revealed a drop of 60 rpm for the left magneto and 80 rpm for the right magneto. Engine power was then advanced to 1,900 rpm for 15 minutes, 2,000 rpm for 15 minutes and 2,100 rpm for 5 minutes. The engine ran smoothly and continuously for the duration of the engine run.

Examination of the fuel selector valve did not reveal any obstructions and the wobble fuel pump operated normally when actuated by hand. According to the Pilot's Operating Handbook (POH), the wobble pump is normally used during starting and emergency operations.

The POH, dated June 22, 1943, was intended for models of the accident airplane that belonged to the United States Navy and included procedures for the engine start, takeoff, and the climb. The "Starting Procedure" stated that the fuel selector should be moved to the "Main Tank" and subsequently primed using the wobble pump with the throttle control in the "IDLE-CUTOFF" position. There was no procedure to change fuel tanks until having reached the "CRUISING" stage of flight, which required the pilot to select the "FRONT TANK." Similar procedures were found in a the POH for a subsequent model, dated January 7, 1947.

The airplane was equipped with three fuel tanks beneath the cabin: a front tank, a main tank, and a rear tank, totaling 122 gallons. According to the POH, the main tank should be selected for takeoff and landing.

The November 2018 issue of *The Howard Newsletter*, a publication of the Howard Aircraft Foundation, the airplane's type certificate holder, discussed the fuel system operation in relation to the accident circumstances. According to the issue, the accident airplane make and model should be operated using the forward tank during takeoff and landing. The article further stated that this was "factory direction" for most all Howard DGA-15s; however, the foundation was unable to produce any POHs, engineering data, or placards that required the forward tank be selected during takeoff. The author's opinion of the rationale behind this information is based on a theory that the main fuel tank can become un-ported during takeoff due to the location of the fuel sump, fuel tank quantity, pitch attitude, and acceleration rate.

Howard DGA-15 airplanes holding serial numbers 500 – 700 (the accident airplane was 813), directed the pilot to take off with the fuel selector on the main tank; however, some aircraft in this series were also equipped with a placard that stated, "TAKE-OFF PROHIBITED ON ANY TANK WITH FUEL BELOW YELLOW MARK." In its article, the Howard Foundation stated that the implication behind this placard was that a fuel level at or above the yellow mark was sufficient to preclude any un-portioning of the fuel pickup. Additionally, with the main tank about one-third full, "the acceleration of the Howard, in concert with the pitch attitudes attainable when the aircraft is light, could lead to the un-portioning of the fuel pickup of the main tank." According to a drawing issued by the company's engineering department on November 26, 1943, (see figure) a fuel selector for the accident airplane make and model required selection of the front tank during takeoff and landing.

[illegible]

Figure: Howard DGA 15P Fuel Selector Placard

The Howard Aircraft Foundation provided correspondence that took place between the Howard Aircraft Corporation and the Civil Aviation Authority from 1942 and 1943 and included discussions about a "fuel system failure." The records indicated that an engine failure during takeoff or climb may occur at low fuel quantities. This information did not cite the fuel level that could result in an engine failure. The discussions referenced a re-calibration of the fuel gauges and the installation of a placard that shows the minimal fuel required to take off and land on the main fuel tank.

The Howard Aircraft Corporation ceased operations in 1944. The accident airplane was manufactured in 1943 and was not equipped with a placard or any warning to use the front tank during takeoff or caution the pilot from attempting to takeoff below a specified fuel quantity. In addition, the pilot was unaware of the airplane's history of fuel system failures.

The article included prior incidents of pilots who experienced power interruptions or losses of engine power or discovered that their airplane would not draw fuel from the main tank below a certain fuel quantity. In one example, the pilot experienced an interruption in engine power about 50 feet agl with the fuel selector on the main tank and with a fuel quantity "significantly less than half full." In another example, a Howard Foundation member reported that the airplane will not draw fuel from the main fuel

tank in a three-point attitude if the fuel quantity is less than about 20 gallons, which is just below 1/3 of a tank.

The 0856 recorded weather observation at China Lake Naval Air Weapons Station, China Lake, California, located about 37 nautical miles east of the accident site, included wind from 310° at 4 knots, 10 statute miles visibility, clear skies, temperature 17°C, dew point 03°C, and an altimeter setting of 29.90 inches of mercury.

Pilot Information

Certificate:	Airline transport	Age:	36, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	Lap only
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	Toxicology Performed:	No
Medical Certification:	Class 1 Without waivers/limitations	Last FAA Medical Exam:	July 23, 2018
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	June 6, 2018
Flight Time:	7800 hours (Total, all aircraft), 162 hours (Total, this make and model), 7000 hours (Pilot In Command, all aircraft), 75 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Passenger Information

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

Aircraft and Owner/Operator Information

Aircraft Make:	Howard	Registration:	N9471H
Model/Series:	DGA 15P No Series	Aircraft Category:	Airplane
Year of Manufacture:	1943	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	813
Landing Gear Type:	Tailwheel	Seats:	5
Date/Type of Last Inspection:	April 26, 2018 Annual	Certified Max Gross Wt.:	4500 lbs
Time Since Last Inspection:	20 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	2208 Hrs as of last inspection	Engine Manufacturer:	Pratt and Whitney
ELT:	C91A installed, not activated	Engine Model/Series:	R985 AN-14B
Registered Owner:		Rated Power:	450 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:	2284 ft msl	Distance from Accident Site:	37 Nautical Miles
Observation Time:	08:56 Local	Direction from Accident Site:	90°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	3 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	70°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.9 inches Hg	Temperature/Dew Point:	19°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Kernville, CA (L05)	Type of Flight Plan Filed:	None
Destination:	Bakersfield, CA (L45)	Type of Clearance:	None
Departure Time:	08:44 Local	Type of Airspace:	Military operation area;Class G

Airport Information

Airport:	Kern Valley L05	Runway Surface Type:	Asphalt
Airport Elevation:	2614 ft msl	Runway Surface Condition:	Dry
Runway Used:	17	IFR Approach:	None
Runway Length/Width:	3500 ft / 50 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Destroyed
Passenger Injuries:	1 None	Aircraft Fire:	On-ground
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	35.723609,-118.418609

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen		
Additional Participating Persons:	John Jensen; Federal Aviation Administration; Fresno, CA Paul Bjornstad; Howard Aircraft Foundation; NV		
Original Publish Date:	August 24, 2021	Investigation Class:	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98371		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).