National Transportation Safety Board
Aviation Accident Final Report

Location:	Mojave, CA	**Accident Number:**	WPR16LA110
Date & Time:	05/13/2016, 1530 PDT	**Registration:**	N68TQ
Aircraft:	Seguin Quickie	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General Aviation - Flight Test		

Analysis

The commercial pilot and a colleague constructed the single-place, composite airplane with the intention of using it for air racing purposes. Rather than using the single piston engine and propeller specified by the original plans, they opted to power the airplane with two turbojet engines. The engines were designed and intended for use only on model aircraft and were mounted one per side on the lower fuselage, just aft of the cockpit.

The airplane was in the very early stages of its flight test program and had flown only two previous flights with an accumulated total flight time of about 0.8 hours. The purpose of the accident flight was to begin exploring the crosswind handling characteristics and capabilities of the airplane. About 200 ft above ground level (agl) during the first landing approach, the pilot conducted a go-around and climbed to pattern altitude for another approach. While in the landing flare about 10 ft agl, a gust of wind from the right side disturbed the airplane, and the pilot applied power to go around. He heard one engine "spool down" and confirmed a power loss on the left engine via the instrument indications. The wind gust and power loss caused the airplane to track left toward an array of unused airliners stored at the airport. Since the airplane's single-engine minimum control speed had not yet been determined, preflight planning called for reducing power on the remaining engine and landing in the event of an engine power loss; however, the pilot maintained about 30-40% thrust on the right engine to avoid impacting one of the airliners. The asymmetric thrust resulted in a loss of directional control, and the airplane was destroyed when it struck a wooden office trailer and the ground. There was insufficient evidence to determine the reason(s) for the loss of engine power, and none of the three most likely causes (fuel flow interruption, air flow interruption, or flameout due to rapid and large throttle input) could be definitively ruled out.

Probable Cause and Findings

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

A loss of engine power for reasons that could not be determined based on the available information.

Findings

Not determined	Not determined - Unknown/Not determined (Cause)

Factual Information

History of Flight

Approach-VFR go-around	Loss of engine power (partial) (Defining event)
	Loss of control in flight

On May 13, 2016, about 1530 Pacific daylight time, an experimental amateur-built Quickie, N68TQ, was destroyed when it impacted a structure and terrain following a loss of engine power at Mojave Air and Space Port (MHV), Mojave, California. The pilot received minor injuries. The test flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed.

The airplane was originally developed and designed as a kit to be powered by a single piston engine. According to the pilot, he and another individual had modified the airplane to be powered by two turbine engines, and they planned to use it for air-racing purposes. The accident flight was the third flight of the airplane, which had accumulated a total of approximately 0.8 hours of flight time, all by the accident pilot. The flight was intended to begin exploring the crosswind handling capability and characteristics of the airplane. The pilot intended to conduct several circuits in the airport traffic pattern, each terminating in a low approach and go around, with one landing at the end of the flight.

The pilot departed on runway 12, and conducted his first approach to runway 26. When the airplane was about 200 feet above ground level (agl), the pilot abandoned that approach, and climbed back up to pattern altitude for another approach. This time, based on the winds, he maneuvered for a landing on runway 12. While in the flare at approximately 10 feet agl, a gust from right side disturbed the airplane, and the pilot applied power to go-around. He heard an engine "spool down," and confirmed a power loss on the left engine via the instrument indications. The gust disturbance and power loss caused the airplane to track left towards the airliners stored at MHV, and the pilot found himself headed for a parked B-747. He maintained approximately 30-40% thrust on the right engine to clear the B-747, but he was unable to correct the directional slew with full aileron/rudder controls. The airplane cleared the parked B-747, continued to descend, and impacted a wooden office trailer and the ground shortly thereafter.

Pilot Information

Certificate:	Commercial	**Age:**	33, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without Waivers/Limitations	**Last FAA Medical Exam:**	09/09/2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	1681 hours (Total, all aircraft), 1 hours (Total, this make and model), 1575 hours (Pilot In Command, all aircraft), 58 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

The pilot held a commercial pilot certificate with multiple ratings. He reported that he had about 1,650 total hours of flight experience, including about 0.8 hours in the accident airplane make and model. His most recent flight review was completed in May 2015, and his most recent Federal Aviation Administration (FAA) second class medical certificate was issued in September 2015. The pilot was employed as a professional test pilot for a general aviation airplane manufacturer.

Aircraft and Owner/Operator Information

Aircraft Make:	Seguin	**Registration:**	N68TQ
Model/Series:	Quickie	**Aircraft Category:**	Airplane
Year of Manufacture:	2016	**Amateur Built:**	No
Airworthiness Certificate:	Experimental	**Serial Number:**	001
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	04/12/2016, Condition	**Certified Max Gross Wt.:**	480 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Jet
Airframe Total Time:	0.8 Hours at time of accident	**Engine Manufacturer:**	PBS
ELT:	Not installed	**Engine Model/Series:**	TJ-40
Registered Owner:	On file	**Rated Power:**	88 lbs
Operator:	On file	**Operating Certificate(s) Held:**	None

General

FAA information indicated that the airplane was built by the pilot, and registered to him in February 2016. The pilot reported that the airplane was equipped with two Czech-manufactured PBS-TJ40 turbine engines, and that the engines were FADEC (full authority digital engine control) equipped.

The airplane was primarily of composite (glass cloth and resin) construction. It was a canard design, with the wings mounted aft and above the single-place cockpit. The two fixed main landing gear were located at the ends of each canard, and a tailwheel was situated below the single vertical stabilizer and rudder.

The original design for a nose-mounted piston engine was modified by the builders; they fabricated and installed a faired nose cone, and installed the two turbine engines just aft of the cockpit, one on either side of the fuselage, near where the side surfaces transitioned to the bottom surface. One engine was attached to either end of a through-strut, so that each engine/thrust centerline was located about 2 feet outboard of the fuselage centerline.

Engine Information

The engine was designed and marketed for use on model aircraft. According to the engine manufacturer's Operation and Maintenance Manual (OMM), the TJ40-G1 was a single-shaft turbojet engine with a single-stage radial compressor, annular combustion chamber, single-stage axial turbine, and an exhaust nozzle. A starter-generator was housed in the compressor impeller assembly. A ceramic spark plug was integrated in the combustion chamber, and "evaporating pipes" were used for "generation of the mixture of fuel and air."

The engine produced about 88 pounds of thrust. Idle fuel consumption was cited as 20 ml/min (0.32 gallons per hour- gph), and maximum fuel consumption rate was 19.2 gph.

The OMM contained the following caution:
"The TJ40-G1 turbojet engine is designed exclusively for model aircraft and is not suitable for any other purpose. Never use it for people, objects or vehicle; it can only be used for properly designed model aircraft. Any other use can result in injury or death."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	MHV, 2801 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	1520 PDT	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	15 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.95 inches Hg	**Temperature/Dew Point:**	32°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Mojave, CA (MHV)	**Type of Flight Plan Filed:**	None
Destination:	Mojave, CA (MHV)	**Type of Clearance:**	None
Departure Time:	1515 PDT	**Type of Airspace:**	Class D

The MHV 1520 automated weather observation included winds from 210 degrees at 15 knots, visibility 10 miles, clear skies, temperature 32 degrees C, dew point minus 2 degrees C, and an altimeter setting of 29.95 inches of mercury. The 1540 winds were reported as being from 220 degrees at 18 knots.

Airport Information

Airport:	Mohave Air and Space Port (MHV)	**Runway Surface Type:**	Asphalt
Airport Elevation:	2801 ft	**Runway Surface Condition:**	Dry
Runway Used:	12	**IFR Approach:**	None
Runway Length/Width:	12500 ft / 200 ft	**VFR Approach/Landing:**	Traffic Pattern

MHV was situated at an altitude of about 2,800 feet msl. It was equipped with three runways, as follows:
- Runway 4/22: 4,746 by 60 feet
- Runway 8/26: 7,049 by 100 feet
- Runway 12/30: 12,503 by 200 feet

The runways were arranged so that the thresholds of 4 and 8 were essentially collocated, and that apex was situated about 4,000 feet south-southwest of the threshold of runway 12. Numerous stored/unused airliners were parked east of runway 12, between the centerlines or extended centerlines of runways 4 and 8.

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	35.058889, -118.150556 (est)

The airplane impacted in an area of the airport used to store and/or dismantle unused airlines. The highly fragmented wreckage was located in a relatively compact area, about 3,000 feet down runway 12, about 1,500 feet northeast of its centerline.

The airplane struck the office trailer, located among the airliners, while it was still airborne. The trailer was oriented with its longitudinal axis approximately east-west, and the airplane initially struck the east end of the south side, headed north. Damage patterns were consistent with the airplane passing completely through the trailer. The canards, wings, vertical stabilizer, and one engine were all fracture-separated from the fuselage. The fuselage was ruptured just aft of the cockpit, but the cockpit remained relatively intact. No leaked fuel was observed at the scene, and there was no fire.

No FAA or NTSB personnel responded to the scene on the accident day, and the wreckage was collected and transported to the pilot's hangar at MHV for subsequent examination. An FAA inspector examined the wreckage a few days after the accident.

All components were accounted for. The inspector observed leaked fuel below the fuselage section where the fuel tank was mounted. He was unable to determine the remaining fuel quantity, or whether the tank was breached. Neither engine displayed any evidence of an uncontained failure, or other evidence of any pre-impact mechanical failures.

Additional Information

Pilot's Helmet

The pilot reported that during the flight and accident, he was wearing his Gentex brand model HGU-68 helmet. The Gentex website indicated that the helmet "was designed to meet the rigorous requirements of the U.S. Navy and Marine Corps" and is equipped "with a single visor system qualified at 600 KEAS (Knots Equivalent Air Speed) in accordance with MIL-H-85047A."

The pilot reported that the visor was down at the time of the accident, but that the visor opened during the accident sequence, and the pilot sustained a black eye. In a written communication to the NTSB, the pilot stated that his "natural flinch" position was to turn his head slightly to the right, which resulted in the helmet visor friction knob, located on the left side of the helmet, being in a more forward-facing position. He noted that "something in the crash caught the friction knob (there are marks on the knob and the visor is cracked right there) and pulled it open, presenting my eye to the crash."

Potential Engine Power Loss Causes

Turbine engines can experience significant power losses, or cease operation altogether, primarily due to the disturbance or cessation of the supply of one of the two principle input components, fuel and air. Fuel flow interruptions can be caused by fuel exhaustion, fuel starvation, contaminated or clogged lines or filters, or loss of fuel pressure.

Inlet air disruptions are typically the result of disturbed airflow due to atmospheric turbulence, or high sideslip or angle of attack values. Inlet airflow disturbances will often result in compressor stall, where the compressor airfoils exceed their critical angle of attack. Compressor stalls are normally accompanied by loud reports such as "bangs" or a more steady roaring sound.

Imbalances between the fuel- and air-flows into the engine can also result in "flameout," where the fuel air mixture in the combustion chamber is either too lean or too rich to support combustion, and the fire in the combustion chamber is extinguished. Such imbalances are most often triggered by rapid and/or large commanded changes to engine thrust levels.

In his accident statements to the NTSB, the pilot reported that the left engine lost all power just after he commanded go-around thrust. He reported that he believed that the loss of power was caused by the disturbed or blocked airflow to the engine, due to the gust from the right that prompted the go-around. He did not report any sounds similar to a compressor stall.

Pilot-Reported Fuel System Information

The pilot provided the following information regarding the fuel system configuration, indications, and post-accident condition:
- The fuel tank had an estimated capacity of 7 gallons, including 1 gallon unusable
- The fuel tank was situated below the forward front cockpit, under the pilot's legs
- The tank quantity was "gauged with a very repeatable float type mechanical fuel gauge on the top of the tank" directly visible to the pilot, on the cockpit floor between his legs
- The fuel is routed from the tank to a tee fitting, and then through two shut off valves; the valves were found in the "ON" position at the accident site
- Fuel indication just prior to the accident was between 3/8 and 1/2 tank

The pilot reported the following planning and operational information
- "Bingo" fuel (the quantity at which the testing was to be terminated and the airplane landed) was 1/2 tank
- The takeoff fuel quantity was sufficient for 85 minutes of flight when flying the planned test profile. He amplified that value by stating that "That is in economy cruise at 80 mph," and was

"based on the L/D check we did on flight one."
- He acknowledged that with "Full power on both engines, the duration is much much shorter."
- Full power on both engines yields a climb rate of "greater than 2,000 fpm."

The pilot provided his estimate of times and power settings for the flight as follows:
- The airplane was towed to the runway, and the engine was started at the hold short line
- The engine was run for 3 minutes at 20% power to recharge the batteries
- Applied full power for takeoff; duration was "1-2 minutes"
- Idle descent for 7 minutes.
- Conducted an approach to runway 26 down to 500 feet; terminated in go-around
- Approximately "20 seconds [at] full power"
- Idle descent to runway 12; terminated in accident

NTSB Fuel Burn Calculations

Using the pilot-reported initial usable fuel quantity of 6 gallons and the OMM maximum fuel burn rate, the two engines could be run for a total of about 9.2 minutes at full throttle.

Based on the pilot's estimates, the engines were run for about 17 minutes on the accident flight. Calculations that used the pilot's estimated flight times and power settings, and linear interpolation for fuel burn rate between idle and full thrust, indicated that the flight would have consumed a total of approximately 2 gallons of fuel.

Unknowns regarding this aspect of the investigation included the actual pre- or post-flight fuel quantity, the actual fuel burn rates at the various power settings, the actual power settings, or the actual flight durations at those power settings.

Minimum Control Airspeed

Loss of thrust in one engine of a multi-engine airplane will reduce or eliminate climb capability, and will introduce directional control problems that result from asymmetric thrust in non-centerline thrust configuration airplanes. Minimum control speed airborne (Vmca) is defined by 14 CFR part 23 as the minimum speed at which directional control, under a very specific set of circumstances, can be maintained with the critical engine inoperative while airborne in a multi-engine airplane. Vmca does not require or provide for a positive rate of climb. Vmca is a function of multiple factors, and is established by the manufacturer during flight test. Because the airplane had accumulated less than 1 hour of total flight time in its test program, Vmca had not been yet determined.

The Airplane Flying Handbook (AFH, FAA-8083-3) contained the following text regarding engine failures. "A takeoff or go-around is the most critical time to suffer an engine failure. The airplane will be slow, close to the ground, and may even have landing gear and flaps extended. Altitude and time will be minimal...Airplane climb performance will be marginal or even non-existent, and obstructions may lie ahead...With loss of an engine, it is paramount to maintain airplane control and comply with the manufacturer's recommended emergency procedures."

The pilot stated that because Vmca had not yet been determined, the flight test program's engine failure plan called for the pilot to reduce thrust in the operating engine to idle, and land

wherever practical. He reported that following the loss of left engine thrust, he had to maintain some thrust on the right engine in order to avoid striking the parked airliners. He also reported that the resulting thrust asymmetry resulted in his limited ability to control the airplane flight path.

Engine FADEC Data

The engine was equipped with limited non-volatile memory as part of the FADEC. The pilot sent both engines (including their FADEC modules) to the engine manufacturer in the Czech Republic for analysis, but the manufacturer only provided limited feedback, which did not provide any useful information regarding the reason(s) for the engine failure.

Onboard Video Recordings

A private film production company had teamed with the pilot and his colleague to produce a documentary about the airplane development and testing. In support of that effort, the company had installed several video cameras on the airplane and/or pilot for this flight. Film company personnel recovered most of those cameras prior to the NTSB becoming aware that they were installed. Based upon the pilot's description of the contents, the NTSB investigator in charge decided not to request or retain any of the imagery, due to its limited usefulness to the investigation.

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	**Report Date:**	05/01/2017
Additional Participating Persons:	Ray Martin; FAA; Van Nuys, CA		
Publish Date:	05/01/2017		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=93163		