Aviation Investigation Final Report

Location:	RACINE, Wisconsin	**Accident Number:**	CHI94FA248
Date & Time:	July 28, 1994, 22:23 Local	**Registration:**	N79752
Aircraft:	CONSOLIDATED-VULTEE BT-13A	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

WITNESSES HEARD THE VINTAGE WWII TRAINER TAKING OFF AT NIGHT. THEY REPORTED THAT DURING THE INITIAL CLIMB, THE ENGINE SOUND VARIED FROM HIGH TO LOW RPM 4 TIMES, THEN THEY HEARD THE AIRPLANE COLLIDE WITH THE TWO-STORY APARTMENT BUILDING. A PILOT APPROACHING TO LAND AT THE DEPARTURE AIRPORT REPORTED SEEING THE ACCIDENT AIRPLANE AT LOW ALTITUDE AND '...NOT CLIMBING OR CLIMBING AT A VERY SHALLOW ANGLE.' OTHER WITNESSES DESCRIBED THE ENGINE AS 'SPUTTERING' AND 'BACKFIRING.' AN ON-SCENE INVESTIGATION REVEALED THAT THE ENGINE'S 10:1 COLLECTOR INTERMEDIATE GEAR HAD TWO TEETH MISSING. METALLURGICAL EXAMINATION OF THE FRACTURES BY THE SAFETY BOARD REVEALED FEATURES CONSISTENT WITH OVERSTRESS SEPARATION.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: LOSS OF POWER FOR UNDETERMINED REASON(S). THE DARK NIGHT WAS A RELATED FACTOR.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) REASON FOR OCCURRENCE UNDETERMINED

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
2. (F) LIGHT CONDITION - NIGHT
3. OBJECT - RESIDENCE

Factual Information

HISTORY OF FLIGHT

On July 28, 1994, at 2223 central daylight time (cdt), a Consolidated-Vultee BT-13A, N79752, registered to KWA Leasing of Libertyville, Illinois, and piloted by an airline transport rated pilot, was destroyed when it collided with an apartment building during initial climb following takeoff from runway 14 (6,556' X 100' dry asphalt) at the John H. Batten Airport, Racine, Wisconsin. Visual meteorological conditions prevailed at the time of the accident. The 14 CFR Part 91 personal flight was not operating under a flight plan. The pilot and passenger were fatally injured. The flight departed Racine, Wisconsin, at 2220 cdt.

Two airport employees said they heard the airplane takeoff and recalled that its engine sound went from high to low RPM four times before it collided with the apartment building. A pilot of an airplane approaching the airport to land reported he saw the airplane taking off. He said the airplane "...appeared to be approximately 30 feet off the ground and not climbing or climbing at a very shallow angle."

Two additional witnesses said they saw the airplane flying low before it hit the apartment building. One of these witnesses stated she was driving toward the apartment building and saw smoke coming from the airplane. She was asked how she identified smoke coming from the airplane. She said the airplane was back lighted by the moon. This witness said its engine "...sounded funny." Other witnesses described N79752's engine as "sputtering" and "backfiring."

OTHER DAMAGE

N79752 collided with a wood frame, twenty-unit, two story, apartment building at 2904 Mt. Pleasant Street, Racine, Wisconsin. The second floor north and first floor northeast apartments were consumed by fire. The north end of the building's roof was consumed by fire. Its north wall and north end of the building's west exterior wall were consumed by fire. Hallways on the first and second floor were smoke damaged. A 1991 GMC "Jimmy" Blazer was destroyed by fire. A 1989 Mercury Marquis had fire damage to its left side and roof.

CREW INFORMATION

According to the pilot's logbooks, he first flew a BT-13 on October 19, 1990. His logbook record showed he had flown the BT-13 103.5 hours, excluding the flight to and from Oshkosh, Wisconsin, on July 28, 1994. The logbook showed the pilot had not recorded any dual instruction received in the BT-13. Before flying the BT-13, the pilot had flown the North American AT-6/SNJ (AT-6) and Boeing PT-17 airplanes. The AT-6 is configured similarly to the

BT-13 except that it has a larger engine.

AIRCRAFT INFORMATION

According to a March 11, 1992, aircraft logbook entry, N79572 had been completely disassembled for rebuild. The logbook showed an airframe total time of 3,117 hours on that date. Included in this rebuilding process was the installation of an overhauled Pratt and Whitney R985-AN1 engine and new fuel selector valve. The engine's estimated total time before overhaul was 5,860 hours. An engine logbook entry dated July 25, 1994, showed 112.7 hours since major overhaul.

Engine overhaul records showed the collector section of the engine had new bearings and a collector drive floating gear installed. The engine's collector section records showed that other associated shafts and gears were considered "OK", and not new.

WRECKAGE/IMPACT INFORMATION

N79752 collided near the top of a two story apartment building's north wall. The airplane was found inverted on the ground in front of the building's north wall. The fuselage had been consumed by fire between the engine and tailcone just forward of the vertical stabilizer. The fire damaged engine, still attached to the airframe, was resting on the top, left front, of the GMC Blazer.

The center of the left wing had its bottom skin crushed aft, and upward, from the leading edge to its tie down ring. It had been separated from the fuselage by fire. The wing root was fire damaged. The right wing had leading edge crush at the wing tip rib inboard to an area next to the aileron's mid-span point. The remainder of the wing had been destroyed by fire. The empennage's fabric control surfaces were burned. The right horizontal stabilizer and elevator were bent up about 30 degrees between the surface's tip and mid-span position.

The front cockpit's fuel selector handle had been destroyed by fire. The rear cockpit's fuel selector handle was partially melted. The rear fuel selector handle was positioned between "Right-hand Main" and "OFF." The fuel selector control rods were connected between the fuel selector and cockpit handles but were bent and twisted in many places. Examination of the fuel selector valve revealed it was positioned on the "Reserve" fuel tank. Inspection of the valve's interior revealed dust and small pieces of a brown colored material.

The rear of the engine's stainless steel collector ring pan was colored black between the 3:30 and 8:30 positions. Black blended into a greenish bronze between the 8:30 and 10:30 positions. The greenish bronze blended into a light bronze color between the 10:30 and 3:00 positions. The engine rotated freely, its magneto and fuel pump drives undamaged and rotated during this process. Thumb compression was identified on cylinders 1,9,2,and 3. The remainder of the cylinders had their respective valve pushrods bent. The spark plugs were a brown/tan in color and no debris was observed in the electrodes. No foreign particles were

found in the engine's oil or oil bypass screen.

During the engine's rotational examination the supercharger blower impeller, P/N 12788, moved inconsistently. When the engine was not being rotated, the impeller could be moved through a 60 degree arc. During engine rotation the impeller could be prevented from moving by applying light hand pressure during part of the rotational activity.

Disassembly of the collector case revealed the 10:1 collector intermediate gear, P/N 6515 (10:1 gear), had two teeth missing from it. A third tooth was not aligned with the remaining teeth. The 10:1 gear's teeth mesh with those of the collector drive floater gear, P/N 8797 (floater gear). The floater gear had three teeth that were misaligned with the remainder of its teeth. The 10:1 gear's separated teeth were found wedged between piping in the case.

The intake portion of the carburetor body had melted. Evidence of fuel was not observed in the float bowl or accelerator pump well. The top of the float was 3/32 of an inch below the float bowl's top edge. The float was clean and had no fuel in it. The carburetor's needle valve was in its seat and did not have any contaminants on it. The needle valve was repeatedly seated during blow testing.

TESTS AND RESEARCH

N79752's 10:1 gear, its separated teeth, and the floater gear were examined by the NTSB's Materials Laboratory Division of the Office of Research and Engineering. The report states: "Examination showed that both teeth separated at the root fillets. The fracture faces of both teeth were covered with rust and showed evidence of extensive post-separation damage. In addition, both fracture surfaces contained sharp longitudinal indentations... . A similar indentation was found on the top land of the gear tooth located next to one of the separated teeth." The report says that the examination could not find indications of excessive surface wear on the teeth of either gear.

One of the separated gear teeth had a dimple-fracture mode, consistent with overstress separations. No evidence of progressive cracking was observed during the examination. The second gear tooth had most of its fracture surface obliterated by post-separation damage according to the report. The report ends by stating: "Examination of the undamaged regions of the tooth revealed features consistent with overstress separations. One of the tooth side faces contained a longitudinal sharp indentation mark which extended through almost the entire width of the tooth." The metallurgist's factual report is appended to this report.

ADDITIONAL INFORMATION

During the engine tear down it was revealed that the disengagement of the 10:1 and floater gears would cause a power interruption. Once the teeth were reengaged, the engine would produce power until they became disengaged.

A statement from the proprietor of the Midwest Aviation Museum, Danville, Illinois, stated the BT-13 engine would not surge if there was a total blockage of the engine's fuel supply. An operator of airplanes having the same type engine N79752 was equipped with confirmed the museum proprietor's statement. She stated that the reported surging sound is generated by the propeller when the power is interrupted.

The autopsy of the pilot and passenger was performed by the Milwaukee County Medical Examiner, Milwaukee, Wisconsin. The autopsy stated the cause of death was thermal injuries with smoke inhalation. The toxicological examination was performed by the FAA's Civil Aeromedical Institute in Oklahoma City, Oklahoma. The results of the test were negative.

The wreckage was released to Mr. Edward C. Wilson, Naperville, Illinois, N79752's insurance company representative on July 29, 1994.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	37,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	October 14, 1993
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	6680 hours (Total, all aircraft), 104 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	CONSOLIDATED-VULTEE	**Registration:**	N79752
Model/Series:	BT-13A BT-13A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	7128
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	July 25, 1994 Annual	**Certified Max Gross Wt.:**	4350 lbs
Time Since Last Inspection:	113 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3230 Hrs	**Engine Manufacturer:**	P&W
ELT:		**Engine Model/Series:**	R-985-AN1-14B
Registered Owner:	KWA LEASING	**Rated Power:**	450 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	MKE ,720 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	21:51 Local	**Direction from Accident Site:**	350°
Lowest Cloud Condition:	25000 ft AGL	**Visibility**	12 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	20°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	, WI (RAC)	**Type of Flight Plan Filed:**	None
Destination:	WAUKEGAN , IL (UGN)	**Type of Clearance:**	None
Departure Time:	22:20 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	JOHN H. BATTEN FIELD RAC	**Runway Surface Type:**	Asphalt
Airport Elevation:	674 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	14	**IFR Approach:**	None
Runway Length/Width:	4823 ft / 100 ft	**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	42.750522,-87.810409(est)

Administrative Information

Investigator In Charge (IIC):	Gattolin, Frank
Additional Participating Persons:	CHUCK EBERT; MILWAUKEE , WI KAREN KREUGER; MILWAUKEE , WI
Original Publish Date:	May 9, 1995
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=9383