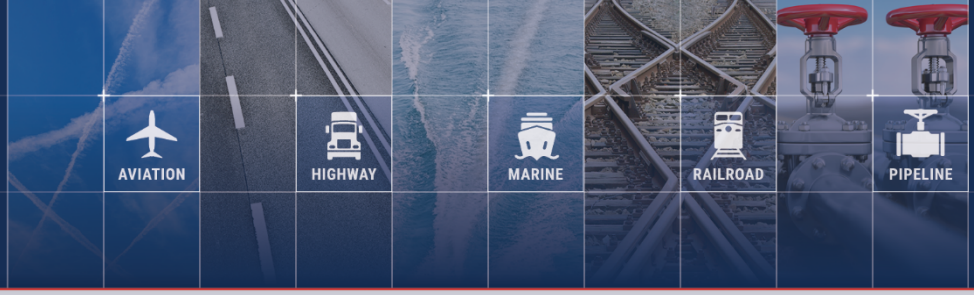

Aviation Investigation Final Report

Location:	MALONE, New York	**Accident Number:**	NYC95LA137
Date & Time:	July 1, 1995, 11:50 Local	**Registration:**	CGMEZ
Aircraft:	FIELD VARI-EZE	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

THE PILOT APPLIED POWER AT THE COMPLETION OF A LOW PASS OVER A RUNWAY AND NOTICED A VIBRATION 1 TO 2 SECONDS LATER. THIS WAS FOLLOWED BY A LOSS OF PROPELLER THRUST AND HIGH ENGINE RPM. THE PILOT SECURED THE ENGINE, AND DUE TO THE LOCATION OF PERSONNEL AND TREES, INITIATED A TURN BACK TO THE RUNWAY. AT THE COMPLETION OF THE TURN, HIS APPROACH TO THE RUNWAY WAS OBSTRUCTED BY ANOTHER AIRPLANE, AND THE PILOT LANDED IN A ROUGH FIELD ADJACENT TO THE RUNWAY. DURING THE LANDING ROLL, THE MAIN LANDING GEAR AND LEFT WING SEPARATED. INVESTIGATION REVEALED THAT THE AIRPLANE WAS EQUIPPED WITH A SUBARU ENGINE AND A ONE-OF-A-KIND, THREE-BEARING, PROPELLER SPEED REDUCTION UNIT (PSRU). THE THREE-BEARING PSRU HAD REPLACED A PRODUCTION TWO-BEARING PSRU, WHICH HAD ACCUMULATED 125 HOURS SUCCESSFULLY. EXAMINATION OF THE PSRU REVEALED THAT THE PROPELLER SHAFT FAILED NEAR THE CENTER BEARING. THIS WAS DUE TO THERMAL EXPANSION OF A MOUNTING PLATE, WHICH RESULTED IN A BENDING OF THE SHAFT AT THE CENTER BEARING.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: failure of the propeller speed reduction unit due to an inadequate design change by the manufacturer, which resulted in a complete loss of thrust. A factor was the rough terrain.

Findings

Occurrence #1: PROPELLER FAILURE/MALFUNCTION
Phase of Operation: MANEUVERING

Findings
1. (C) REDUCTION GEAR ASSY,PROPELLER SHAFT - FAILURE
2. (C) ACFT/EQUIP,INADEQUATE DESIGN - MANUFACTURER

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY LANDING

Occurrence #3: MAIN GEAR COLLAPSED
Phase of Operation: EMERGENCY LANDING

Findings
3. (F) TERRAIN CONDITION - ROUGH/UNEVEN
4. LANDING GEAR,MAIN GEAR - OVERLOAD

Factual Information

On July 1, 1995, at 1150 eastern daylight time, a homebuilt VARI-EZE, CGMEZ, was substantially damaged during a forced landing to the Malone-Dufort Airport (MAL), Malone, New York. The private pilot was not injured. Visual meteorological conditions prevailed, for the personal flight that departed MAL, at 1130. No flight plan had been filed for the flight conducted under 14 CFR Part 91.

In the NTSB Form 6120.1/2, the pilot stated that he had completed three loose formation passes over runway 23, with another homebuilt airplane. He added power at the completion of the last low pass, and noticed a vibration 1 to 2 seconds later. This was followed by a loss of propeller thrust and high engine RPM.

The pilot secured the engine, and due to personnel to his left, and trees directly ahead and to the right, he initiated a turn back to the runway. At the completion of the 180 degree turn, he observed the airplane from the formation flight approaching head-on. The pilot then performed a landing to a rough field, adjacent to runway 23. During the landing roll, the main landing gear and left wing separated from the airplane.

The pilot stated that initial examination of the wreckage revealed that the propeller shaft had failed at the junction of the middle bearing inner ring.

The pilot further stated:

Prior to removal of the PSRU [propeller speed reduction unit], a professional mechanical engineer and several other knowledgeable people inspected the failed PSRU. The PSRU vendor was also consulted by phone. It was agreed by all...the cause was bending induced fatigue failure, induced by thermal expansion of the PSRU back plate. This caused the front bearing to rise while the center and rear bearings were held rigid by the common housing. This induced a slight bend in the shaft with the stress focused right at the center bearing inner ring.

The PSRU was sent to the Transportation Safety Board (TSB) of Canada, for further examination. The TSB of Canada report stated:

...the shaft failed in a progressive manner from fatigue cracking at the stress concentration provided by the change in shaft diameter...The material of construction was shown to be a unalloyed steel, in the normalized condition, resulting in a relatively low strength material for the application. The fatigue resistance of the part would certainly have been improved by the use of the intended AISI 4140 alloy material...

The airplane was built in 1984, and flown 566 hours with a Lycoming, O-234 engine. In 1994, the Lycoming engine was replaced by a Subaru, EA-81. In addition, a synchronous belt PSRU was installed. This was a "two bearing" unit, that drove the propeller at a ratio of 1.84 to 1. The airplane accumulated another 125 hours with this installation.

During the winter of 1994/1995, the PSRU was replaced with a one-of-a-kind unit. This unit utilized a third bearing to provide support for a longer propeller shaft. According to the pilot's statement, the new unit was ground tested for 8 hours, and flown for 49 flight hours, prior to the failure.

Pilot Information

Certificate:	Private	**Age:**	49,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	April 26, 1995
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	960 hours (Total, all aircraft), 720 hours (Total, this make and model), 910 hours (Pilot In Command, all aircraft), 49 hours (Last 90 days, all aircraft), 32 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	FIELD	**Registration:**	CGMEZ
Model/Series:	VARI-EZE VARI-EZE	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	M001
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	Annual	**Certified Max Gross Wt.:**	1050 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	740 Hrs	**Engine Manufacturer:**	Subaru
ELT:	Not installed	**Engine Model/Series:**	EA-81
Registered Owner:	NIGEL G. FIELD	**Rated Power:**	110 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:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Unknown	**Visibility**	7 miles
Lowest Ceiling:	Broken / 4500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	29°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(MAL)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	11:30 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	MALONE-DUFORT MAL	**Runway Surface Type:**	
Airport Elevation:	786 ft msl	**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	44.839889,-74.290222(est)

Administrative Information

Investigator In Charge (IIC):	Pearce, Robert
Additional Participating Persons:	ALLEN BELCHER; ALBANY , NY
Original Publish Date:	November 25, 1996
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=38981