



# National Transportation Safety Board Aviation Accident Final Report

<b>Location:</b>	Marana, AZ	<b>Accident Number:</b>	SEA08LA149
<b>Date &amp; Time:</b>	06/01/2008, 0816 MST	<b>Registration:</b>	N62JV
<b>Aircraft:</b>	Van Heeswyk Lightning	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Part(s) separation from AC	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Personal		

## Analysis

While maneuvering adjacent to a private airstrip at a low altitude, witnesses reported observing the propeller assembly separate from the airplane. The pilot maneuvered towards the airstrip and leveled out on runway heading about mid-length of the runway. As the airplane crossed over the end of the runway, it banked to the left and descended into terrain, impacting an open desert field adjacent to several residential homes. Examination of the airplane revealed that the airframe and both wings were structurally damaged. The propeller assembly, including the propeller flange extension were found separated from the engine crankshaft. No further anomalies were noted with the airframe and engine that would have precluded normal operation. The attachment bolts were installed on a painted surface of the propeller flange extension. The paint surrounding this area was flaking away from the surface. Evidence of thread locking material was observed in the threaded areas consistent with installation instructions. Examination of the attachment bolts revealed that four of the six bolts exhibited fracture surfaces consistent with fatigue. One of the four bolts exhibited a multifaceted fracture surface with multiple origins around the circumference. Hardness of this bolt was checked and found to be within the specified hardness range.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The insufficient clamping force resulting in a fatigue fracture of the propeller extension attachment bolts and subsequent separation of the propeller assembly in flight. Contributing to the accident was the pilot's failure to maintain sufficient airspeed to avoid an inadvertent stall while maneuvering during the emergency approach to the airport.

## Findings

<b>Aircraft</b>	Performance/control parameters - Not attained/maintained (Factor) Propeller system - Fatigue/wear/corrosion (Cause)
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## Factual Information

### HISTORY OF FLIGHT

On June 1, 2008 about 0816 mountain standard time, an amateur built Van Heeswyk Lightning experimental airplane, N62JV, was substantially damaged when it impacted terrain while maneuvering near Marana, Arizona. The airplane was registered to and operated by the pilot operated under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. The private pilot, who was the sole occupant of the airplane, was killed. Visual meteorological conditions prevailed and no flight plan was filed. The local personal flight originated from Ryan Field Airport, Tucson, Arizona, about 0559.

Witnesses located adjacent to the accident site reported to a Federal Aviation Administration Inspector (FAA) that they observed the airplane over fly a private airstrip at an altitude of about 100 feet above ground level (agl) to the northwest. As the airplane passed over the end of the airstrip, witnesses reported observing the propeller assembly separate from the airplane followed by the engine "revving up". The airplane was observed making a "tear-drop" turn towards the airstrip and leveled out on a southeasterly heading about mid-length of the airstrip. The witnesses stated that the airplane continued flying on the runway heading. As the airplane passed over the end of the runway, it banked to the left and descended into terrain.

### PERSONNEL INFORMATION

The pilot, age 62, held a private pilot certificate with an airplane single-engine land rating. The pilot also possessed a repairman experimental aircraft builders certificate. A third-class airman medical certificate issued June 30, 2003, with the limitation stated "must wear corrective lenses for near and distant vision." Review of the pilot's logbook flight records revealed that as of the pilot's most recent logbook entry on May 19, 2008, he had accumulated 640.5 hours total flight time, of which 9.8 hours were in the accident make/model airplane. The pilot had logged 5.3 hours within the previous 90 days and 2.2 hours within the previous 30 days to the accident.

### AIRCRAFT INFORMATION

The experimental amateur built two-seat, low-wing, fixed-gear airplane, serial number (S/N) 7 was built by the owner/pilot. It was powered by a Jabaru 3300 engine, rated at 120 horse power and equipped with a Sensenich EX-Pitch Composite propeller. According to FAA records, the airplane was registered to the pilot on November 8, 2007.

Review of the airframe logbooks revealed that the airplane was initially inspected and issued a special airworthiness certificate on December 24, 2007. The most recent maintenance performed on the airplane was conducted on May 4, 2008, at a total airframe time of 6 hours.

The Jabaru J ALL Constructors Manual, dated January 30, 2008, states the following installation instructions and requirements for the installation of the propeller flange extension:

"Objectives of this task:

To remove the universal propeller flange that is shipped with the engine and fit the model specific propeller flange extension to the crankshaft. While this is a straightforward mechanical task it is most definitely a critical task and care must be taken. The universal propeller flange is lock wired in place, however the depth of the propeller flange extension makes the use of lock

wire almost impossible and so we use a strong Loctite to keep the flange securely fitted. This means that the cleanliness of all threads is critical. This task will require 2 people: 1 to stop the crankshaft from moving and 1 to loosen and later tighten the cap screws. This task is intended to be performed by the kit builder with the engine mounted to the aircraft. In the factory we do this task while the engine is fitted to a mobile engine stand so some of the photos will be slightly different to what the kit builder could expect to see.

Materials and equipment required:

Loctite 620

Thread cleaner – Loctite or Acetone

5/16" Hex drive socket, or alternately a 5/16" Allen key cut straight and fitted to a 5/16" socket

Torque wrench, set to 30 ft/lbs or 40 Nm

Remove the universal flange

The universal flange is held in place by 6 x 3/8" UNF Allen head cap screws, all of which will be reused. Cut and remove the lock wire from the 6 cap screws, then heat the cap screws with a heat gun in order to loosen the Loctite. Lock the engine from turning by holding a large blade screwdriver in the ring gear teeth between the starter motor and the adjacent alloy block (circled in the photo above right). Crack each cap screw in turn to break the Loctite seal and remove each cap screw and the related washer. Set the cap screws and washers aside for later use. Remove the flange and discard.

Clean and prepare the screws and hub

Clean the cap screw threads with a wire brush - make sure that there is no residual Loctite in the threads. Clean all threads with cleaning solvent (Loctite cleaner or Acetone) and dry. Run a 3/8" UNF flat bottomed tap all the way into each bolt hole in the hub, apply a cleaning solvent (Loctite cleaner or Acetone) into each hole and then blow dry with compressed air. Check that each thread is absolutely clean and dry before proceeding.

Fit the propeller flange extension

Set your torque wrench to 30 ft/lbs or 40 Nm and place it on top of the engine. Apply a few drops of Loctite to each screw hole, place the propeller flange extension on the hub and fit the 6 cap screws and washers. Have your helper lock the engine from turning and tighten all the cap screws firmly then torque each cap screw to 30 ft/lbs or 40 Nm, working in a criss-cross pattern as shown at right. Re-check each cap screw, applying steady pressure on the torque wrench until the torque value is reached. In the factory we have the workers change places at this point so that the torque values are set by one person and double-checked by the other as an additional safety measure."

According to a witness, the pilot had used his facility to build the airplane and had always brought his own expendable items in a small toolbox. Family members of the pilot reported that Permatex Medium Strength Threadlocker Blue was found within the pilot's toolbox along with various other sealants.

#### METEOROLOGICAL INFORMATION

Review of recorded data from the Tucson International Airport (TUS) automated weather observation station, located 32 miles southeast of the accident site revealed at 0753 conditions

were: wind from 150 degrees at 6 knots, visibility 10 statute miles, clear sky, temperature 24 degrees Celsius, dew point minus 8 degrees Celsius, and an altimeter setting of 30.00 inches of Mercury.

#### WRECKAGE AND IMPACT INFORMATION

Examination of the airplane by a Federal Aviation Administration (FAA) inspector revealed that the airplane came to rest upright within an open desert field adjacent to several residential homes. The fuselage was partially separated aft of the cabin area. The wreckage debris path remained within about a 30-foot circumference to the main wreckage. Two bushes, about four feet in height, were observed on the forward and aft sides of the right wing and appeared to be undamaged. All primary flight controls were located within the accident site. The propeller assembly and propeller extension were found separated from the engine and were located about .62 miles northwest of the accident site.

#### MEDICAL AND PATHOLOGICAL INFORMATION

The Pima County Medical Examiner's office conducted an autopsy on the pilot on June 2, 2008. The medical examiner determined that the cause of death was "...blunt impact."

The FAA's Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on the pilot. According to CAMI's report, carbon monoxide, cyanide, volatiles, and drugs were tested. Unspecified amounts of Alfuzosin and Metoprolol were found within the blood and liver specimens.

#### TESTS AND RESEARCH

On June 5, 2008, at the facilities of Air Transport, Phoenix, Arizona, the recovered airframe and engine were examined by a representative from Arian Aircraft under the supervision of the NTSB investigator-in-charge.

Flight control continuity was established throughout the airframe from the cockpit controls to all primary flight control surfaces. No mechanical anomalies were noted with the airframe.

The engine remained attached to the airframe and exhibited no external damage. The propeller assembly, including the propeller flange extension was separated from the engine crankshaft. The engine was removed from the airframe and disassembled. The engine crankshaft, propeller flange extension, and attachment bolts were sent to the NTSB Office of Research and Engineering, Materials Laboratory Division for further examination.

Examination of the bolts revealed that four of the six propeller flange extension attachment bolts that attach the propeller extension to the forward end of the crankshaft were fractured in the threads where the bolt intersected the forward face of the crankshaft. The fracture surfaces on the four bolts exhibited signatures consistent with fatigue cracking and overstress. One of the four bolts exhibited a multifaceted fracture surface with multiple origins around the circumference. Hardness of this bolt was checked and found to be within the specified hardness range. A light green material was observed between the bolt threads and the crankshaft threads, consistent with a thread locking material.

Heavy fretting damage was observed on the aft side of the propeller flange extension where it contacted the crankshaft forward face. Wear matching the thread pattern of the bolts was observed on the bore of the attachment bolt holes in the propeller flange extension.

Most of the surfaces of the propeller flange extension were partially covered with a silver colored paint. In some areas, the paint was flaking from the surface. In areas where the paint was adhered, the paint could be easily removed by scratching with a fingernail. A sample of the flaked paint was removed from the surface with tweezers, and the paint deformed easily under pressure from tweezers. No paint was observed on the surface that mated to the crankshaft or on the surface that mated to the propeller. However, paint was observed on the forward side of the propeller flange extension in the attachment bolt area including the washer contact area, and on the aft side of the propeller attachment flange.

Silver colored paint covered surfaces up to the edges of the washer contact areas on the propeller flange extension. Light gray, dark gray, and orange material was observed on the surface of the propeller flange extension in the washer contact area.

### History of Flight

<b>Maneuvering</b>	Part(s) separation from AC (Defining event)
<b>Emergency descent</b>	Part(s) separation from AC
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

### Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	62, Male
<b>Airplane Rating(s):</b>	Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 With Waivers/Limitations	<b>Last Medical Exam:</b>	06/30/2008
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	01/26/2008
<b>Flight Time:</b>	640 hours (Total, all aircraft), 10 hours (Total, this make and model), 5 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Van Heeswyk	Registration:	N62JV
Model/Series:	Lightning	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	Yes
Airworthiness Certificate:	Experimental	Serial Number:	7
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	12/24/2007, Unknown	Certified Max Gross Wt.:	1425 lbs
Time Since Last Inspection:		Engines:	Reciprocating
Airframe Total Time:		Engine Manufacturer:	Jabaru
ELT:	Not installed	Engine Model/Series:	3300
Registered Owner:	On file	Rated Power:	120 hp
Operator:	On file	Air Carrier Operating Certificate:	None

## Meteorological Information and Flight Plan

Observation Facility, Elevation:	KTUS, 2643 ft msl	Observation Time:	0753 MST
Distance from Accident Site:	32 Nautical Miles	Condition of Light:	Day
Direction from Accident Site:	120°	Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	24° C / -8° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	6 knots, 150°	Visibility (RVR):	
Altimeter Setting:	30 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tucson, AZ (KRYN)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	None
Departure Time:	0559 MST	Type of Airspace:	

## Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal		

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Joshua Cawthra	<b>Adopted Date:</b>	12/08/2008
<b>Additional Participating Persons:</b>	Steven D D'Urso; Federal Aviation Administration; Scottsdale, AZ Nick Otterback; Arion Aircraft; Shelbyville, TN		
<b>Publish Date:</b>	12/08/2008		
<b>Investigation Docket:</b>	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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