Aviation Investigation Final Report

Location:	Bedford, Massachusetts	**Accident Number:**	IAD04LA018
Date & Time:	April 28, 2004, 15:03 Local	**Registration:**	N3243P
Aircraft:	Beech A36	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the first takeoff after the installation of an overhauled engine, about 400 feet, the engine rpm dropped, then went to zero. The pilot turned back toward the airport and unsuccessfully attempted an engine restart with the boost pump in the "high" position. The airplane subsequently landed perpendicular to a runway, all three landing gear collapsed, and the airplane came to rest between two parked airplanes. During a post-accident examination, the cockpit fuel boost pump lever was found in the "high" position, and there was no evidence of fuel spillage or spray within the engine compartment. In addition, torque paste on the engine-driven fuel pump's return line B-nut fitting was found to be 1/4 turn counter-clockwise (loosened) in relation to the torque paste on the receiving end of a 90-degree elbow fitting. When the B-nut was hand-tightened, the torque paste on both fittings were aligned. When the B-nut was further tightened with a wrench, the paste was misaligned again, but about 1/4 turn further clockwise. Multiple engine runs revealed that when the B-nut was fully tightened with a wrench, and when it was also hand-tightened to the point where the B-nut paste was aligned with the 90-degree fitting paste, the engine ran smoothly. When the B-nut was loosened to a point nearly to where it was initially found, the engine quit. During subsequent testing, while the B-nut was being loosened and the engine started to quit, the boost pump was turned on to the "high" position. The engine then ran, but fuel was sprayed from the fitting. When the B-nut was further backed off, the engine would quit and could not be restarted, even with the boost pump operating. Maintenance facility personnel subsequently conducted similar tests on another airplane with a similar fuel system. When the B-nut was loosened sufficiently to allow fuel leakage, the engine quit. However, during those tests where the engine began to quit and the auxiliary fuel pump switch was placed in the high position, the engine continued to run.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The mechanic's failure to properly torque the engine-driven fuel pump's return line B-nut fitting.

Findings

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

Findings
1. (C) FUEL SYSTEM,LINE FITTING - UNDERTORQUED
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PERSONNEL

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

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Factual Information

On April 28, 2004, at 1503 eastern daylight time, a Beech A36, N3243P, was substantially damaged during a forced landing at Bedford/Laurence G. Hanscom Field (BED), Bedford Massachusetts. The certificated commercial pilot was not injured, and the passenger received minor injuries. Visual meteorological conditions prevailed, and no flight plan had been filed for the local post-maintenance test flight, which was conducted under 14 CFR Part 91.

The flight was the first flight after the installation of an overhauled engine. The pilot was the owner of the airplane, and the passenger, who was the president of the maintenance company that installed the engine, Nagle Aircraft Incorporated, was onboard to monitor its performance.

According to the pilot, he started the engine about 1445, and subsequently taxied the airplane to runway 29. Engine run-up was normal, and the takeoff was "normal with [the] engine running smooth." After rotating the nose at 78 knots, the pilot crabbed into a 30-degree crosswind, then accelerated to 110 knots. About 200 feet above the ground, the pilot raised the landing gear, and about 400 feet, he noticed that the engine rpm had dropped to 2,550. "Moments later," the engine failed and the tachometer went to zero.

The pilot lowered the airplane's nose to maintain 90 knots, and determined that there wouldn't be enough runway remaining to land straight ahead. He turned the airplane to the left, to aim for taxiway W, and unsuccessfully attempted an engine restart with the "electric fuel pump."

The pilot then turned the airplane further to the left, to cross runway 05 perpendicularly, and aimed for a gap within a line of parked airplanes. The airplane touched down just after crossing runway 05, all three landing gear collapsed, and the airplane came to a stop in the midst of the parked airplanes without striking them.

Two Federal Aviation Administration (FAA) inspectors initially examined the airplane. According to the president of Nagle Aircraft, "the FAA, immediately after the accident, clearly noted that there was no fuel staining identified within the engine compartment and no fuel odor present in and around the engine compartment."

Both inspectors subsequently replied that they did not recall the statement. However, they did note that they could not inspect the engine compartment closely because the left cowling was jammed and could not be opened.

On May 17, 2004, the airplane was examined under Safety Board direction. Among the items examined, the cockpit fuel boost pump lever was found in the "high" position, and once the cowling was removed, there was no evidence of fuel spillage or spray within the engine compartment. In addition, torque paste on the engine-driven fuel pump's return line B-nut was

found to be about 1/4 turn counter-clockwise (loosened) in relation to the torque paste on the receiving end of a 90-degree elbow fitting. When the B-nut was hand-tightened, the torque paste on both fittings were aligned. When the B-nut was further tightened with a wrench, the paste was again misaligned, but about 1/4 turn further clockwise.

Multiple engine runs were subsequently conducted. When the B-nut was hand-tightened to where its torque paste was aligned with the 90-degree fitting torque paste, and also when it was fully tightened with a wrench, the engine ran smoothly. When the B-nut was loosened to nearly where it was found during the initial examination, the engine quit.

During further testing, while the engine was running, the B-nut was loosened to a point where the engine started to quit. The auxiliary fuel pump was then turned on, to the "high" position, and the engine ran normally, but fuel was sprayed toward the left side of the engine compartment from the fitting. When the fitting was further loosened, the engine quit and could not be restarted, even with the auxiliary fuel pump operating. The testing was repeated several times with the same results.

The return fuel line, which was new, was subsequently removed and visually examined, with no anomalies noted to either the hose or the B-nut threads. There were also no anomalies noted to the receiving, 90-degree elbow fitting threads, which were also new.

Subsequent to the examination and testing on May 17, 2004, personnel from Nagle Aircraft conducted another series of tests on a different airplane, but with a similar engine and fuel supply system. According to the company president, the fuel return B-nut fitting was loosened to the point where it was found on the accident airplane, and the engine ran numerous times without quitting. When the fitting was loosened sufficiently to allow for fuel leakage (fuel was then being sprayed in the compartment), the engine quit. During all of the company's subsequent tests, when the engine began to quit, the auxiliary fuel pump was placed in the "high" position, and the engine continued to run.

Pilot Information

Certificate:	Commercial	**Age:**	58,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	November 17, 2003
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	November 20, 2003
Flight Time:	3095 hours (Total, all aircraft), 1245 hours (Total, this make and model), 3030 hours (Pilot In Command, all aircraft), 7 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N3243P
Model/Series:	A36	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	E-2943
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	April 26, 2004 Annual	**Certified Max Gross Wt.:**	3650 lbs
Time Since Last Inspection:	2 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1550 Hrs at time of accident	**Engine Manufacturer:**	Teledyne Continental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-550B
Registered Owner:	Harwil Avaition, Inc.	**Rated Power:**	300 Horsepower
Operator:	Hager S. Harrison	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BED,130 ft msl	**Distance from Accident Site:**	
Observation Time:	15:03 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 7000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots / 22 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	350°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.98 inches Hg	**Temperature/Dew Point:**	11°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Bedford, MA (BED)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	VFR
Departure Time:	15:03 Local	**Type of Airspace:**	Class B

Airport Information

Airport:	Bedford/Hanscom BED	**Runway Surface Type:**	Asphalt
Airport Elevation:	133 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	29	**IFR Approach:**	None
Runway Length/Width:	7001 ft / 150 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	42.463333,-71.293334

Administrative Information

Investigator In Charge (IIC):	Cox, Paul
Additional Participating Persons:	William Wicks; FAA/FSDO; Boston, MA Joseph Nagle; Nagle Aircraft, Inc.; Bedford, MA Scott Boyle; Teledyne Continental Motors; Mobile, AL
Original Publish Date:	April 28, 2005
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=59134