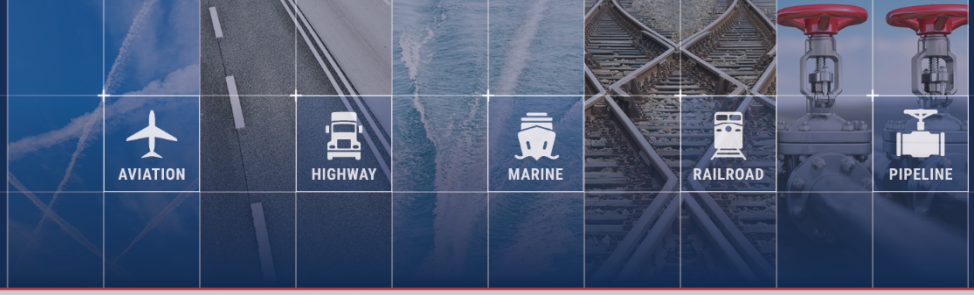

Aviation Investigation Final Report

Location:	CORVALLIS, Oregon	**Accident Number:**	SEA98FA109
Date & Time:	June 21, 1998, 15:30 Local	**Registration:**	N50TX
Aircraft:	Nolley BD-5T	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the assembly of the home-built aircraft, its wet-wing fuel tanks were sloshed with a sealer (Randolph #802) that is not compatible with alcohol fuel additives. During the aircraft's three week engine test run and test flight sequence, Jet-A fuel containing an ethanol fuel additive (Prist) was in its fuel tanks. This resulted in the sloshing compound debonding from the fuel tank walls and partially blocking an in-line fuel filter. Because of this blockage, approximately 25 minutes into the fourth test flight, the aircraft experienced a total loss of power. During the subsequent forced landing, the aircraft nosed over when one of its wings became entangled in tall vegetation. During the investigation it was determined that the owner/builder, the test pilot, representatives of the company that helped mate the engine to the airframe, and the supplier of the engine/propeller/gearbox assembly, all of whom were present for the ground run and test flight sequence on that day, were not aware that an alcohol fuel additive may be present in some Jet-A fuel at the time of purchase.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The introduction of a fuel containing an ethanol additive into fuel tanks sloshed/sealed with a compound incompatible with alcohols, resulting in debonding of the compound from the fuel tank walls, leading to partial blockage of an in-line fuel filter, and a total loss of engine power due to fuel starvation. Factors include an inadequate preflight and tall vegetation in the field where the forced landing was attempted.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: MANEUVERING

Findings
1. (C) FLUID,FUEL - IMPROPER
2. (F) AIRCRAFT PREFLIGHT - IMPROPER - PILOT IN COMMAND
3. (C) FUEL SYSTEM,TANK - DEBONDED
4. (C) FUEL SYSTEM,FILTER - BLOCKED(PARTIAL)
5. (C) FLUID,FUEL - STARVATION

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

Occurrence #3: NOSE OVER
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
6. (F) TERRAIN CONDITION - HIGH VEGETATION

Factual Information

HISTORY OF FLIGHT

On June 21, 1998, approximately 1530 Pacific daylight time, a turboprop-powered, experimental Nolley BD-5T, N50TX, nosed over during a forced landing in a barely field, after experiencing a complete loss of power about three miles northeast of Corvallis Airport, Corvallis, Oregon. The sole occupant, a commercial pilot who was conducting flight tests for the owner, was not injured, but the aircraft, which is owned by Mr. Mell B. Nolley, sustained substantial damage. The 14 CFR Part 91 flight, which was the fourth of a series of test flights made after issuance of the aircraft's Limited Duration Airworthiness Certificate, departed Corvallis Airport about 25 minutes prior to the accident, and was being operated in visual meteorological conditions. No flight plan had been filed, and there was no report of an ELT activation.

According to the pilot, he was in a shallow banked left turn when the engine suddenly quit. He tried several times to restart the engine, but was not successful. He therefore elected to make a forced landing in a nearby field in which tall barely was growing. The aircraft touched down in an upright position, but one wing caught in the barely and the aircraft nosed over.

AIRCRAFT INFORMATION

During the investigation, the aircraft's fuel system was separated into components and subjected to inspection. During the inspection it was discovered that a paper fuel filter (model # ROL-PAK RF-6235-3A) had become clogged by what appeared to be the sloshing compound used to seal the wet-wing fuel tanks. Inspection of the interior of the fuel tanks revealed that the majority of the sloshing compound in the left wing tank had separated from the tank walls and flowed to the very inboard end of the tank. There it had accumulated in large puddles near the fuel pick-up line and fuel drain valve. The sloshing compound in the right tank had also separated from the tank walls, and most of it had accumulated on the outboard side of the baffle between the inboard tank bay and the bay just outboard of it. The fuel drain valve in the left tank, which had been mated to the tank after the sealant had cured, was coated with sealant and stuck in the closed position. The drain in the right tank, which was also added to that tank after the sealing process was complete, was not coated with sealant and functioned normally.

Further investigation revealed that the tanks had been sloshed with Randolph #802 Sloshing Sealer, which was allowed to cure for approximately four weeks prior to the introduction of Jet-A fuel into the system. This particular sloshing compound is not compatible with alcohol fuel additives, and there is a note on the can which states, " 802 Sloshing Sealer is not approved for use with any type of fuel containing additives such as alcohol, methanol, gasohol, etc..." During

the investigation, it was determined that the Jet-A used to fill the tanks of this aircraft contained the anti-icing fuel additive, Prist. The Prist, also known as 2-Methoxy Ethanol or Ethylene Glycol Monomethyl Ether (CH3-O-CH2-CH2-OH), had been pre-mixed in the Jet-A as the fuel was loaded into the fueling truck. This fuel had been in the aircraft fuel system for about three weeks prior to the accident flight, and the engine had been operated on this fuel, both on the ground and in the air, for about eight and one-half hours prior to the accident. Neither the aircraft owner/builder, nor the test pilot were aware that some Jet-A fuel comes directly from the fueling truck with an additive already pre-mixed. Two other individuals present at this flight were the supplier of the engine, gearbox and propeller combination, and the owner of the company which produced some of the aircraft's components and assisted in mating the engine system to the airframe. Neither of these individuals were aware that Jet-A could contain an ethanol additive. On the day of the accident, the owner completed a series of high-speed taxi tests, and then approximately 12 gallons of fuel were added to the tanks. After the aircraft was fueled, the test-pilot arrived at the airport to continue his test-flight program. He did not drain fuel from either of the tanks prior to the flight, and the owner had not drained fuel prior to the taxi tests.

TESTS AND REASEARCH

As part of the investigation, a set of aluminum strips were coated with Randolph #802 sloshing sealer. This non-drying, elastic compound, which is formulated to seal pinhole leaks around rivets and prevent corrosion in fuel tanks, is applied as a liquid and normally allowed to cure for a minimum of 24 hours. The test strips were allowed to cure for three weeks, and then placed in Prist-containing fuel acquired from the fixed base operator (FBO) where the original fuel had been purchased. Another strip was coated with #802 compound, allowed to cure for 48 hours, and placed in Jet-A fuel not containing any additives. A third set of strips were coated with Randolph #912 (Alcohol Resistant Sloshing Sealer), allowed to cure for three weeks and placed in fuel containing Prist. Also, a control strip was coated with #802 sealer, left to cure, and not exposed to any fuels or additives.

By the end of the first week, the #802 compound on the strips in the additive-containing fuel had begun to thin near the top of the strips and accumulate thicker near the bottom. At the end of the second week, there was clear evidence of the compound running/flowing down the strips, and there was a significant accumulation of the compound near their lower ends. During the third week, compound started dripping from the bottom of the strips and accumulating in puddles in the bottom of the test container. By the end of the third week, there was very little evidence of any compound remaining on the top thirty percent of the strips. By the end of the fourth week, the majority of the compound had separated from the strips and was present as puddles of thick, sticky liquid in the bottom of the container.

After four weeks, the #802 compound on the strip soaking in the fuel without any additive showed no evidence of being effected by the immersion, and its feel and consistency on the strip appeared to be the same as on the control strip. In addition, their was no evidence of any change to the Randolph #912 alcohol-resistant compound that had been soaking in the fuel

containing Prist.

ADDITIONAL DATA AND INFORMATION

As a follow-on to the investigation, the NTSB contacted ten FBO's in each of six states, in order to inquire as to whether the Jet-A in their trucks had an anti-icing additive premixed in it, or not. Each of these operators was selected from a list of those advertising "additive available" in the 1998 edition of AOPA's Airport Directory. The percentage of FBO's who already had the additive pre-mixed in their fuel truck (as opposed to having it available on the truck to be added upon request) is as follows:

Washington: 30% Oregon: 50% California 50% Florida: 60% Illinois: 100% Minnesota: 100%

It was also discovered that in some geographical areas, almost all of the Jet-A provided to FBO's comes from the distributor already containing an ethanol additive.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	37,Male
Airplane Rating(s):	Single-engine land; 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:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	May 31, 1997
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	775 hours (Total, all aircraft), 2 hours (Total, this make and model), 690 hours (Pilot In Command, all aircraft), 19 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Nolley	**Registration:**	N50TX
Model/Series:	BD-5T BD-5T	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	629
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	October 1, 1996 Unknown	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	8 Hrs	**Engines:**	1 Turbo prop
Airframe Total Time:	8 Hrs	**Engine Manufacturer:**	QUANTUM
ELT:	Not installed	**Engine Model/Series:**	APU
Registered Owner:	MELL B. NOLLEY	**Rated Power:**	95 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:	Clear	**Visibility**	20 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	25°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	, OR (CVO)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	15:05 Local	**Type of Airspace:**	Class G

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**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:**	44.630798,-123.269699(est)

Administrative Information

Investigator In Charge (IIC):	Anderson, Orrin
Additional Participating Persons:	PINAR CRANE;
Original Publish Date:	January 10, 2000
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=45307