Aviation Investigation Final Report

Location:	Apache Junction, Arizona	**Accident Number:**	LAX04LA125
Date & Time:	February 17, 2004, 13:40 Local	**Registration:**	N330KT
Aircraft:	Knapple/Wray Lancair IV-P	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The airplane was observed by three witnesses in a flat counterclockwise spin from about 2,000 feet as it descended to ground impact. No one observed the airplane prior to the spin. All of the witnesses, one of whom is a commercial pilot, heard the sound of the turbine engine running throughout the spin, which consisted of 3 or 4 complete rotations. The purpose of the flight was to meet the specifications as outlined in the Phase 1 flight testing portion of the experimental operating limitations, as issued by the FAA. This was the third recorded flight. Due to the post-impact fire, control continuity was not confirmed during the subsequent wreckage examination. No evidence of preexisting mechanical malfunctions was noted with either the engine or propeller assembly. The engine and propeller control linkages were in the normal operating range near flight idle. During engine disassembly and teardown, a composite material, similar to a heat shield material commonly used to insulate the composite cowling, was located in the compressor and burner sections of the engine. The engine is a reverse flow free power turbine, with the power turbine shaft connected to the propeller. The engine is mounted in the airframe with the compressor inlet at the rear of the engine compartment.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot/builder's failure to maintain an adequate airspeed while maneuvering that resulted in an inadvertent stall/spin.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings
1. (C) AIRSPEED - NOT MAINTAINED - PILOT IN COMMAND
2. (C) STALL/SPIN - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On February 17, 2004, about 1340 mountain standard time a Knapple/Wray Lancair IV-P experimental airplane, N330KT, impacted desert terrain, in the Lost Dutchman State Park, 5 miles north of Apache Junction, Arizona. The airplane was destroyed during the impact and post-crash fire. The pilot was operating the airplane under the provisions of 14 CFR Part 91. The airline transport certificated pilot and passenger, who were the accident airplane's builders, sustained fatal injuries. Visual meteorological conditions prevailed and no flight plan had been filed. The pilot had departed from the Falcon Field, Mesa, Arizona, about 1315, for a test flight in the local area.

A friend and coworker of the accident pilot reported to the National Transportation Safety Board investigator that the pilot and passenger built the airplane. The purpose of the flight was to gain flight hours for certification purposes. The airplane was in the first stage of its certification program. The accident flight was the third test flight. After departure, the pilot planned to perform touch-and-go takeoffs and landings at the Williams Gateway Airport, located approximately 19 nautical miles (nm) from the departure airport. The airplane's fuel tanks were filled from a tank located in the passenger's vehicle prior to departure.

A pilot at the Falcon Field witnessed the airplane prior to, and during its departure. He stated that the airplane performed a high-speed taxi. During the taxi, the propeller went "flat, like an over speed event." He said the airplane "barely stopped" prior to reaching the end of the runway. The pilot then taxied the airplane to the departure end of runway 04R and began the takeoff roll. During the takeoff roll he again heard the propeller "go flat." The accident pilot continued on a straight-out departure. Approximately 10 minutes later, the witness was departing the airport and noticed a smoke cloud in the area of the accident site.

Another witness to the accident, a commercial certificated pilot located about 1/2-mile from the accident site, did not see the airplane prior to its entry into a spin. He reported observing the airplane in a flat spin, about 2,000 feet above ground level (agl). The airplane spun 3 to 4 times in a counterclockwise direction, over a period of about 15 seconds. A post-impact fire consumed the airplane. The engine sounded like a turbine, and its sound did not change during the airplane's descent.

An additional witness located about 1/4-mile from the accident site stated that the airplane was flying from the north, heading south-southwest. According to the witness, the engine shut down, and the "back of the airplane [the tail] rolled to the right-hand side of the airplane." The airplane turned 180 degrees, entered a nosedive, and appeared to come out of the dive. The airplane then turned in a corkscrew pattern, counterclockwise, until impacting the ground.

Throughout the accident sequence, the engine sound lowered, increased, lowered again, and then "shut off."

A witness driving her car observed the accident airplane and opined that it looked "stationary and circling." Her car windows were down, but she did not hear the airplane's engine. During the airplane's descent, it turned approximately "four to five circles" in a counterclockwise pattern. Just prior to impact, the left wing lifted and the airplane impacted the ground in a nose down attitude. She estimated that she was about 100 yards from the accident site.

After the airplane's impact, this witness took pictures of the airplane with her cellular phone. A review of the pictures taken by the witness indicated that the entire airplane appeared to be at the impact site. The witness stated that, upon impact, the majority of the smoke was initially coming from the right-hand side of the airplane. The witness had flown as a passenger in small general aviation airplanes but was not a pilot. The Safety Board investigator requested copies of the photographs, but none were received. Attempts to reestablish contact with the witness were unsuccessful.

PERSONNEL INFORMATION

A review of Federal Aviation Administration (FAA) airman records revealed that the pilot held an airline transport pilot certificate with a multiengine land rating. He had commercial pilot privileges in single engine airplanes. The pilot had private pilot privileges for glider aero tow. The pilot also held repairman certificates for experimental aircraft. The experimental aircraft were listed as a Nieuport (Serial Number 251), and the accident airplane, a Lancair (Serial Number LIV-215).

The pilot held a second-class medical certificate that was issued on July 22, 2003.

The pilot's personal logbook was not available for review. However, an examination of the pilot's employment records indicated an estimated total flight time of 4,500 hours on February 26, 2002. The pilot reported the following additional flight times on his employment record: 4,340 hours pilot-in-command; 1,310 hours night; 410 instrument hours; 2,080 hours single engine airplane; and 2,420 hours multiengine airplane.

On the pilot's last FAA Airman Medical application dated July 22, 2003, the pilot reported 4,800 total flight hours.

AIRCRAFT INFORMATION

The airplane was a single engine, turbine-powered Lancair IV-P. The airplane's Application for Airworthiness Certificate (FAA Form 2120-0018) was dated October 15, 2003. The special airworthiness certificate was issued on October 25, 2003.

The airplane had a Diemech (Walter) 601D engine, serial number 831080. The airplane had an

Avia V508 three-bladed propeller, serial number 420662246.

The airplane was undergoing its Phase 1 flight testing. According to the experimental operating limitations issued by the FAA for the airplane, the Phase 1 flight testing had to include, in part, the following: 40 hours of operation in the assigned geographic area; all tests flights were to be conducted under visual flight rules, day only, during the flight testing phase; and, no persons may be carried in this aircraft during flight unless that person is essential to the purpose of flight. The airplane had undergone two test flights, and the third flight was commencing when the accident occurred.

METEOROLOGICAL INFORMATION

The closest aviation weather observation station to the accident site was Falcon Field, located 10 nm west of the accident site. The elevation of the weather observation station was 1,394 feet msl. A routine aviation weather report (METAR) for Falcon Field was issued at 1354. It stated: wind from 350 degrees at 8 knots; visibility 35 miles; skies clear; temperature 26 degrees Celsius; dew point -7 degrees Celsius; and altimeter 30.19 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane impacted generally flat, desert terrain. Terrain surrounding the main wreckage was hilly and covered by small desert brush and saguaro cacti. Responding rescue personnel indicated that the wreckage was confined to a 50-foot diameter, and there were no ground scars leading to the wreckage site.

The wreckage was found at the following approximate global positioning satellite coordinates: 33 degrees 26.29 minutes north latitude by 111 degrees 33.08 minutes west longitude. The airplane structure was consumed in a post-impact fire.

MEDICAL AND PATHOLOGICAL INFORMATION

On February 19, 2004, the Maricopa County Coroner completed an autopsy and toxicological tests of specimens from the pilot. The FAA Toxicology and Accident Research Laboratory also performed toxicological tests. The results of analysis of the specimens were negative for carbon monoxide, cyanide, and tested drugs. The results were positive for the following:

18 (mg/dL, mg/hg) ETHANOL detected in Urine
6 (mg/dL, mg/hg) ACETALDEHYDE detected in Urine
1 (mg/dL, mg/hg) N-PROPANOL detected in Urine

TESTS AND RESEARCH

The FAA coordinator oversaw representatives from Lancair and Walter Engines examine the airplane wreckage at Air Transport, Phoenix, Arizona, on February 25, 2004.

According to the Lancair participant, due to the thermal damage sustained to the airframe, he was unable to establish control continuity between the cockpit and the flight control surfaces.

The Walter Engine representative reported that the engine was manufactured by Walter, serial number 831080, in 1983, and was last seen by the factory in 1987. The representative indicated that damage to the engine was consistent with the airplane impacting the ground in a level flight attitude with little or no forward motion. The nose landing gear was found retracted. The representative said the propeller blades appeared to be turning at the time of impact and were in a feathered position.

The fuel filter installed on the firewall contained water and a yellow-brown colored liquid. Foreign matter could be seen through the exhaust port forward of the blades of the power turbine.

An engine teardown was conducted on April 7, 2004, under the supervision of an FAA inspector. Examination of the engine revealed foreign debris inside the combustion area. A fibrous material was affixed to both the inside and outside of the 1/4-inch screen of the inlet area. No evidence of an internal engine failure was noted and there were no noted failures of any internal parts.

The FAA inspector reported that some type of blanket material was ingested into the inlet area and blocked the flow of air to the engine while at the same time being ingested into the combustion area.

A sample of the foreign debris was sent to the Safety Board's Materials Laboratory for examination. The metallurgist concluded that the debris was consistent with dirt and carbon material from a composite structure. Additionally, some of the debris was consistent with rocks, glass reinforced cloth, nickel chromium alloy, resolidified aluminum alloy fragments, and sliding bearing material.

According to the Walter Engine representative, the material located in the engine was most likely ingested during the flight. He concluded by saying that the propeller was feathered and the said material was most likely a heat shield material used to protect the composite cowling.

The Diemech representative reported that the material could have been ingested after impact. Due to the reverse flow freewheeling turbine, the turbine section will still run until the fuel is exhausted.

The Walter representative examined the propeller under the supervision of an FAA inspector. Based on the examination, and discussions with the propeller manufacturer, they concluded that the propeller was properly assembled and no evidence of any preimpact mechanical malfunctions was found. It was concluded that the propeller was feathered upon impact with the ground.

The FAA coordinator recovered a sample of fuel from the main fuel filter during the initial post-accident examination. CTC Analytical Services, Phoenix, tested the fuel. The results listed the fuel as Jet A, and the condition of the fuel was listed as "abnormal." According to the fuel analyst, Jet A fuel normally has an initial boiling point (IBP) of 320 to 330 degrees Celsius. The IBP results of the test were 350 degrees Celsius. The distillation met the specified standards; however, some anomalies were identified.

The Safety Board investigator interviewed an acquaintance of the pilot, who also owned a turbine equipped Lancair IV-P. The acquaintance reported that initially his airplane had been equipped with a reciprocating engine. However, he installed a turbine engine after experiencing a series of power failures. Subsequently, the accident pilot decided to install a turbine engine in his Lancair.

According to the acquaintance, the accident pilot had flown with him in the acquaintance's turbine-powered Lancair on four different occasions. During the first two flights, the accident pilot was seated in the right seat, and he did not fly the airplane. During the third and fourth flights, the accident pilot was seated in the left seat. From the left seat, the accident pilot practiced slow flight, turns, traffic patterns, airspeed changes, power setting changes, and emergency procedures.

The acquaintance indicated that he flew with the accident pilot on the first two test flights in the accident airplane. The accident pilot controlled the airplane without difficulty. The first flight lasted about 30 minutes, and the second flight's duration was about 20 minutes. The accident occurred during the following (third) flight.

Regarding the operational and performance characteristics of the airplane, the acquaintance reported to the Safety Board investigator that the airplane handles well, "but you must stay ahead of it." It has the ability to cruise at 300 knots. If a pilot is not ahead of the airplane, an emergency can occur at a much faster rate.

According to the accident airplane's FAA operating limitations, no passengers were authorized to be carried in the airplane during the Phase I flight testing. Although regulations allow for the airplane to be built by more than one person, during Phase I flight testing a passenger is authorized to fly in the airplane if the passenger is essential to the purpose of the flight and is listed in the airplane's operating limitations.

FAA Advisory Circular 20-27F states the following, in part, under Restrictions:

Carrying Passengers.
You may not carry passengers while you are restricted to the flight test area or during any portion of your Phase I flight test program. We suggest you use a tape or video recorder for recording readings and other similar tasks. If you need an additional crewmember for a particular flight test, specify that in your application program letter for the airworthiness

certificate. We will need this list in your operating limitations.

The special airworthiness certificate issued for the airplane stated, in part, the following information:

This airworthiness certificate authorizes the manufacturer named on the reverse side to conduct production flight tests, and only production flight tests, of aircraft registered to his name. No person may conduct production flight tests under this certificate: (1) Carrying persons or property for compensation or hire; and/or (2) Carrying persons not essential to the purpose of the flight.

ADDITIONAL INFORMATION

The Safety Board investigator released the recovered airplane wreckage to the owner's representative on March 2, 2004. The engine was released to the owner's representative on June 17, 2004. No parts were retained.

Pilot Information

Certificate:	Airline transport; Commercial; Private	**Age:**	51,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	July 22, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 27, 2003
Flight Time:	4800 hours (Total, all aircraft), 4340 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Knapple/Wray Lancair	**Registration:**	N330KT
Model/Series:	IV-P	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	LIV-215
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Condition	**Certified Max Gross Wt.:**	3550 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo prop
Airframe Total Time:	1 Hrs at time of accident	**Engine Manufacturer:**	Diemech (Walter)
ELT:	Not installed	**Engine Model/Series:**	M601-D
Registered Owner:	Michael Wray/George Knapple	**Rated Power:**	725 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KFFZ,1394 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	13:54 Local	**Direction from Accident Site:**	265°
Lowest Cloud Condition:	Thin Overcast / 25000 ft AGL	**Visibility**	35 miles
Lowest Ceiling:	Overcast / 25000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	350°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.19 inches Hg	**Temperature/Dew Point:**	26°C / -7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Falcon Field, AZ (FFZ)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	13:15 Local	**Type of Airspace:**	Class G

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:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	33.441387,-111.551391

Administrative Information

Investigator In Charge (IIC):	Pollack, Wayne
Additional Participating Persons:	John Eller; Federal Aviation Administration; Scottsdale, AZ Bob Wolstenholme; Lancair Corporation; Redmond, OR Bill Maxey; Walter Engine, American Region; Paradise Valley, AZ John Cook; Diemech Turbine, Inc.; DeLand, FL
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