Aviation Investigation Final Report

Location:	Sherman Oaks, California	**Accident Number:**	LAX03FA162
Date & Time:	May 24, 2003, 12:25 Local	**Registration:**	N537Z
Aircraft:	North American T28C	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

On a standard instrument departure procedure, the airplane came out of the clouds in a steep, nose down, inverted attitude and collided with terrain. The weather at the departure airport was 1,700-foot overcast with the tops ranging from about 4,000 to 4,500 feet. The mode C altitude reporting system on board the airplane initially was reporting 1,400 msl, but the pilot reported climbing out of 2,300 msl. Air traffic control made numerous queries about the altitude anomalies and repeatedly asked the pilot to recycle the transponder. In this aircraft, the transponder control head was mounted on the lower right side avionics rail abeam the pilot's seat back. The pilot would have to look down, to the right, and aft to alter any settings on the transponder during flight. The airplane was climbing on a southeasterly course. After a minute ATC issued a left turn to 040 degrees. The pilot acknowledged the course change, but the recorded radar track continued in a southeasterly direction until its last recorded point. Twenty-three seconds after the pilot acknowledged the course change and reported leaving 3,000 feet, he asked ATC if it was a left or right turn to 040. ATC instructed the pilot to turn off the transponder's mode C function. There were no further recorded transmissions from the pilot. The last recorded mode C data occurred 17 seconds after the pilot's last transmission. The mode C altitude reports from the airplane varied from 1,300 feet to a high of 4,100 feet, and erratically fluctuated between those values. The airplane came out of the clouds in a steep, nose down, inverted position, and heading in a northeasterly direction. The wreckage was located north of the last recorded radar position.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's in-flight loss of control due to spatial disorientation. Factors in the accident were the distraction caused by the malfunctioning mode C altitude reporting system, and the

location of the transponder control head, which necessitated repeated pilot head movements to the right and down while in instrument meteorological conditions.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CLIMB - TO CRUISE

Findings
1. (F) FLIGHT/NAV INSTRUMENTS,ALTIMETER,ENCODING - INACCURATE

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: CLIMB - TO CRUISE

Findings
2. (F) WEATHER CONDITION - CLOUDS
3. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
4. (F) SPATIAL DISORIENTATION - PILOT IN COMMAND
5. (F) ACFT/EQUIP,INADEQUATE INSTRUMENT LOCATION - OTHER MAINTENANCE PERSONNEL

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
6. TERRAIN CONDITION - GROUND

Factual Information

1.1 HISTORY OF FLIGHT

On May 24, 2003, at 1225 Pacific daylight time, a North American T28C, N537Z, collided with terrain following an in-flight loss of control after takeoff near Sherman Oaks, California. The accident site was about 4 miles southeast of the Van Nuys Airport (VNY), Van Nuys, California, and the flight's departure point. The owner/pilot was operating the airplane under the provisions of 14 CFR Part 91. The commercial pilot and one passenger were fatally injured; the airplane was destroyed. The personal cross-country flight departed at 1222, en route to Thermal, California. Day visual meteorological conditions prevailed below a solid overcast; the cloud layer base varied between 1,300 and 1,700 feet mean sea level (msl), and tops of the cloud layer were reported between 3,000 and 3,500 feet msl. An instrument flight rules (IFR) flight plan had been filed. The primary wreckage was at 34 degrees 08 minutes north latitude and 118 degrees 25 minutes west longitude.

Witnesses near the accident site reported that they saw the accident airplane coming out of the clouds from the southwest at a high rate of speed, and in a steep nose down attitude. Witnesses also said the radial engine sounded normal. The airplane continued to make noise until impact, which was followed by a post impact explosion.

Information obtained from the Federal Aviation Administration (FAA) indicated that the Southern California Terminal Radar Control (SCT) handled the flight during the accident sequence. According to a review of the air and ground communications tapes, the pilot checked in with the sector controller after being handed off from the Van Nuys tower controller. The pilot contacted the sector controller and reported climbing through 1,600 feet. The controller stated that the airplane's secondary beacon target (Mode C) showed 1,400 feet. About 1 minute later the pilot was issued an amended clearance from 3,000 feet to 4,000 feet. The pilot reported that he was "leaving 3,000 feet." Shortly thereafter, radio and radar contact were lost with the flight.

During the entire flight, the total number of Mode C altitude radar returns were 33. Of those, 14 radar returns indicated zero feet, 5 were at 1,300 feet, 11 were 1,400 feet, and 3 were reported at 4,100 feet.

1.2 PERSONNEL INFORMATION

A review of FAA airman records revealed the pilot held a commercial pilot certificate with ratings for airplane single and multiengine land and instrument airplane.

A review of the FAA medical records revealed that the pilot held a second-class medical

certificate that was issued on January 21, 2003. It had limitations of "holder shall wear corrective lenses."

No personal flight records were located for the pilot. The aeronautical experience listed in this report was obtained from a review of the FAA airman and medical records on file in the Airman and Medical Records Center located in Oklahoma City, Oklahoma. These records indicated as of January 21, 2003, a total flight time of 2,350 hours, with 50 hours logged in the last 6 months.

Training records for the accident pilot were obtained from Flight Safety International. The records indicated that the pilot had completed a recurrent course for the Cessna 300/400 series aircraft per Federal Aviation Regulations (FAR) 61.56 on July 20, 2002. The pilot indicated on his training records he was current for instrument flight, per FAR 61.57(c). In these training records the pilot indicated as of July 20, 2002, a total flight time of 2,350 hours, with 75 hours logged in the last 6 months, and 850 hours total time in the T-28C.

1.3 AIRCRAFT INFORMATION

The airplane was a North American T28C, N537Z, serial number 140537. The airplane was issued a special purpose airworthiness certificate on May 31, 1991, in the experimental category for exhibition and racing. A review of the airplane's logbooks revealed a total airframe time of 8,675.7 hours at the last periodic inspection. The inspection was completed on March 14, 2003. The Hobbs hour meter read 884.0 at the last inspection. The Hobbs hour meter was destroyed.

The airplane had a Wright R-1820 86A engine, serial number BL520727. Total time on the engine at the last periodic inspection was 268.0 hours.

Examination of the maintenance records revealed no unresolved maintenance discrepancies against the airplane prior to the accident flight.

During interviews with maintenance personnel and pilots who had flown the accident airplane, they stated that the transponder was located on the right side rails of the forward cockpit. The pilot would have to look down, to the right, and aft to alter any settings on the transponder during flight.

1.4 METEOROLOGICAL INFORMATION

A staff meteorologist for the National Transportation Safety Board prepared a factual report, which included the following weather for the departure area.

There were three surface weather stations in the vicinity of the accident site. These stations included Van Nuys (KVNY), Burbank (KBUR), and Santa Monica (KSMO). All three California stations had an Automated Surface Observing System (ASOSs). KVNY and KBUR were located

about 6 miles away from the accident site at 331 degrees and 29 degrees, respectively. KSMO was about 7 miles away at 192 degrees. The elevations of KVNY, KBUR, and KSMO stations are 797, 774, and 173 feet, respectively.

Van Nuys, California

Time-1851Z to 1951Z:
Winds were from 160 degrees between 4 and 5 knots; visibility was between 5 and 6 statute miles; sky conditions were overcast between 1,500 and 1,700 feet; temperatures were between 61 degrees Fahrenheit and 63 degrees Fahrenheit; dew point was 55 degrees Fahrenheit; and altimeter settings were between 29.94 inches of Mercury (inHg) and 29.95 inHg.

Burbank, California

Time-1853Z to 1953Z:
Winds were between calm and variable at 5 knots; visibility was 4 statute miles; sky conditions were overcast between 1,100 and 1,300 feet; temperature was 61 degrees Fahrenheit; dew point was 55 degrees Fahrenheit; and altimeter setting was 29.95 inHg.

Santa Monica, California

Time-1851Z to 1929Z:
Winds were between 210 to 220 degrees at 5 to 8 knots; visibility was between 9 to 10 statute miles; sky conditions were overcast between 900 and 1,100 feet; temperature was 61 degrees Fahrenheit; dew point was 55 degrees Fahrenheit; and altimeter setting was 29.96 inHg.

1.5 COMMUNICATIONS
Safety Board investigators reviewed the recorded radio communications between N537Z and Van Nuys ATC ground, Tower and Southern California Terminal Radar Control (SCT).

At 1907Z, N537Z contacted VNY ground control; requested and received clearance to taxi for takeoff. Nine minutes later, N537Z requested and received an IFR clearance; IFR to VFR on top and VFR to Thermal, California.

At 1920Z, N537Z was cleared for takeoff. Two minutes later, VNY tower advised N537Z to contact SCT. The pilot of N537Z reported to SCT he was climbing out of 1,600 feet for 3,000 feet.

SCT observed that the Mode C altitude for N537Z was 1,400 feet. Forty-five seconds after N537Z reported in, SCT advised him of the Mode C error and to "squawk altitude." Twenty seconds later SCT asked N537Z to verify he was climbing out of 1,400 feet. N537Z responded "leaving 2,300" feet.

Ten seconds later, SCT requested N537Z recycle the transponder. N537Z reported the "Mode

C is on." Twenty-seven seconds later, SCT told N537Z to turn left to a heading of 040 degrees. N537Z acknowledged the transmission. Eight seconds later, SCT advised N537Z to stop the altitude squawk and climb and maintain 4,000 feet, and to report the altitude he was climbing out of. N537Z reported "out of 3,000" feet.

At 1924:05Z, N537Z asked SCT, "was that a left or right turn to 040?" (SCT was on the landline and did not answer). At 1924:13Z, the Mode C altitude report was 4,100 feet. Eight seconds later, SCT asked N537Z "what is your altitude?" There was no response from N537Z.

At 1924:22Z, the last Mode C altitude report was 1,400 feet. The last radar report was in the area of the accident site.

1.6 WRECKAGE AND IMPACT INFORMATION

Investigators from the Safety Board and FAA examined the wreckage at the accident scene.

The debris path was along a magnetic bearing of 330 degrees.

The accident site was located on the north slope of the Santa Monica Mountains, bordered by Mulholland Drive to the south, Ventura Blvd. to the north, Beverly Glen Blvd. to the west, and Coldwater Canyon to the east. The accident site was located directly west of Skyline Terrace Drive, a privately owned and maintained road. Skyline Terrace started at Mulholland Drive and ran north where it merged with Glenridge Drive, a public residential road. The accident site was 300 yards north of the intersection of Mulholland Drive and Skyline Terrace.

The accident site varied in slope from 45 to 70 degrees, and was densely populated with oak trees and foliage.

The initial impact crater was on a 45-degree slope with the propeller hub at the center of the crater. There was a linear impression on the ground that was dimensionally similar to the wingspan of the T28C. The impression was oriented 090- to 270-degrees and measured approximately 40 feet across. The wingspan of the accident airplane, per the North American T28C technical manual, was 40.59 feet. The left wing tip with the red navigation lens was located at the east end of the impression. The right wing tip with the navigation light housing, (missing the green navigation lens), was located at the west end of the impression.

The engine, cockpit, and the tail section of the empennage were located 50 feet downslope from the initial impact crater.

1.7 MEDICAL AND PATHOLOGICAL INFORMATION

The Los Angeles County Coroner completed an autopsy. The FAA Toxicology and Accident Research Laboratory performed toxicological testing of specimens of the pilot. The results of analysis of the specimens were negative for carbon monoxide, cyanide, and tested drugs.

The report contained the following positive results: 30 (mg/dL, mg/hg) ehtanol detected in lung, 38 (mg/dL, mg/hg) ehtanol detected in muscle; 19 (mg/dL, mg/hg) acetaldehyde detected in lung; 6 (mg/dL, mg/hg) acetaldehyde detected in muscle; 2 (mg/dL, mg/hg) N-propanol detected in lung; 3 (mg/dL, mg/hg) N-propanol detected in muscle; 2 (mg/dL, mg/hg) N-Butanol detected in muscle.

1.8 FIRE

The post impact fire consumed a majority of the airplane.

1.9 TESTS AND RESEARCH

Investigators examined the wreckage at Aircraft Recovery Services, Pearblossom, California, on May 28, 2003.

1.9.1 Engine Examination

The engine was removed from the airframe and slung from a hoist. The bottom spark plugs were removed and found to be clean with no mechanical deformation. The spark plug electrodes were gray in color, which corresponded to normal operation according to the Champion Aviation Check-A-Plug AV-27 Chart.

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder heads.

Investigators were not able to manually rotate the engine. The engine was extensively damaged during the accident sequence. All accessories, including, but not limited to, the vacuum pump, fuel pump, alternator, starter, magnetos, and carburetor, were destroyed in the accident sequence.

The landing gear was in the up and locked position.

1.9.2 Elevator Trim Cables

1.9.2.1 Right Side Elevator Trim Cable (Forward Section)

The elevator trim cable extended 6 feet forward of the forward elevator trim pulley. The forward end of the elevator trim cable was separated from the continuation of the cable, which would have extended toward the forward portion of the airplane. The end of the cable exhibited a flat angular separation that occurred when the cables were cut by the recovery personnel. There was no broom straw or necking down of the cable.

1.9.2.2 Forward Elevator Trim Pulley (Right Side Control)

The forward elevator trim pulley assembly was mounted on the left inner side of the fuselage at the 289.5-inch station as specified in the North American T28C Illustrated Parts Catalog (IPC). The forward elevator trim pulley is a two-pulley assembly, with the right side elevator trim cable occupying the upper pulley. The phenolic material on the pulley was intact and exhibited minor thermal exposure. The forward elevator trim pulley rotated freely. The elevator trim cable remained on the pulley, and the cable retention post was intact.

1.9.2.3 Middle Elevator Trim Pulleys (Right and Left Side Control)

The middle elevator trim pulleys were used to transition the elevator trim cables from the forward elevator trim pulleys and raise it to the level of the aft elevator trim pulleys.

The middle elevator trim pulley assembly was mounted on the upper inner side of the fuselage at the 298.5-inch station as specified in the T28C IPC. The middle elevator trim pulley was a two-pulley assembly, with rollers mounted side-by-side, vertically. The phenolic material on both pulleys was intact and appeared undamaged. The middle elevator trim pulleys rotated freely. Both left and right elevator trim cables were on their respective pulley. The cable retention posts were in place; however, the right side of the mounting bracket was bent slightly inboard.

1.9.2.4 Aft Elevator Trim Pulley (Right Side Control)

The aft elevator trim pulley was orientated to change the direction of the elevator trim cable from a longitudinal direction of travel to a horizontal direction of travel. The aft elevator trim pulley was mounted on the upper outside of the tail cone fuselage, and normally covered with the vertical fin fairing at the 307.6-inch station as specified in the T28C IPC. The aft elevator trim pulley was a two-pulley assembly with rollers mounted side-by-side, horizontally. The phenolic material on the pulley was intact. The aft elevator trim pulley rotated freely without binding. The elevator trim cable was off the pulley, but the cable moved freely on top of the roller. The underside of the top plate of the aft elevator trim pulley was painted with green paint; no abrasions were observed. There were witness marks, silver or gray in color, on the top edge of the roller.

1.9.2.5 Right Side Elevator Trim Cable (Aft Section)

The elevator trim cable extended approximately 36 inches past the aft elevator trim pulley. The end of the cable exhibited a flat angular separation, with no broomstrawing or necking down. Approximately 4 inches from the end of the cable, some of the strands of the cable were separated and broomstraw in appearance. The remainder of the cable continued to the fractured end.

1.9.2.6 Left Side Elevator Trim Cable (Forward Section)

The elevator trim cable extended 15 inches forward of the forward elevator trim pulley. The forward end of the elevator trim cable was separated from the continuation of the cable, which would have extended toward the forward portion of the airplane. The end of the cable exhibited a flat angular separation that occurred when the cables were cut by the recovery personnel. There was no broomstrawing or necking down of the cable noted.

1.9.2.7 Forward Elevator Trim Pulley (Left Side Control)

The forward elevator trim pulley assembly was mounted on the left inner side of the fuselage at the 289.5-inch station as specified in the T28C IPC. The forward elevator trim pulley was a two-pulley assembly, with the left side elevator trim cable occupying the lower pulley. The phenolic material was completely missing from the pulley. The remaining bearing was shiny and silver colored. The forward elevator trim pulley rotated freely. The elevator trim cable was found on the bearing, and the cable retention posts were intact. The turnbuckle, located 2-feet forward of the forward elevator trim pulley, was found trapped between the forward elevator trim pulley and the middle elevator trim pulley. The safety wire on the turnbuckle was in place.

At the forward connection of the elevator trim cable to the turnbuckle, several strands of the cable had separated. The remainder of the cable was still connected to the turnbuckle. The aft connection of the elevator trim cable to the turnbuckle was intact with no separation noted.

1.9.2.8 Aft Elevator Trim Pulley (Left Side Control)

The aft elevator trim pulley was oriented to change the direction of the elevator trim cable from a longitudinal direction of travel to a horizontal direction of travel. The aft elevator trim pulley was mounted on the upper outside of the tail cone fuselage, and normally covered with the vertical fin fairing at the 307.6-inch station as specified in the T28C IPC. The aft elevator trim pulley was a two-pulley assembly with the rollers mounted side-by-side, horizontally.

The phenolic material was intact. The aft elevator trim pulley was bound and would not rotate. The elevator trim cable was off of the pulley and trapped between the roller and the top mounting plate.

The aft cable retention post was missing from its mounting place on the fuselage. Aluminum on the left edge of the top mounting plate, aft of the roller, and adjacent to the separated aft cable retention post. The separation extended inboard 1-inch. The edges of the torn aluminum had striations of approximately the same size as the braid of the elevator trim cable.

The aft cable retention post was missing, with the separation of the aluminum ending at this point. The elevator trim cable extended through the cable retention post hole. The elevator trim cable was intact at the point of exit.

1.9.2.9 Left Side Elevator Trim Cable (Aft Section)

The elevator trim cable extended approximately 6 feet past the aft elevator trim pulley. The end of the cable exhibited a broomstrawing and necking down.

Approximately 30 inches past the aft elevator trim pulley, portions of cable strands were separated and broomstraw. The cable was curled but otherwise undamaged.

1.10 ADDITIONAL INFORMATION

The aircraft logbooks indicated that the airplane was equipped with an Ameri-King Emergency Locating Transmitter (ELT), model number AK-450. The ELT was destroyed during the accident sequence.

The Safety Board investigator released the wreckage to the owner's representative on June 16, 2003.

Pilot Information

Certificate:	Commercial	**Age:**	56,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):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	January 21, 2003
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	2350 hours (Total, all aircraft), 850 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	North American	**Registration:**	N537Z
Model/Series:	T28C	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	140537
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	March 14, 2003 Condition	**Certified Max Gross Wt.:**	9000 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	8675.7 Hrs as of last inspection	**Engine Manufacturer:**	Wright
ELT:	Installed, not activated	**Engine Model/Series:**	R-1820-86B
Registered Owner:	On file	**Rated Power:**	1450 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	VNY,799 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	12:24 Local	**Direction from Accident Site:**	313°
Lowest Cloud Condition:		**Visibility**	5 miles
Lowest Ceiling:	Overcast / 1700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	17°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Van Nuys, CA (VNY)	**Type of Flight Plan Filed:**	IFR
Destination:	Thermal, CA (TRM)	**Type of Clearance:**	IFR
Departure Time:	12:22 Local	**Type of Airspace:**	Class B;Class D

Airport Information

Airport:	VAN NUYS VNY	**Runway Surface Type:**	
Airport Elevation:	799 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

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:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	34.141666,-118.432502

Administrative Information

Investigator In Charge (IIC):	Jones, Patrick
Additional Participating Persons:	LADD SCOTT; Federal Aviation Administration; Van Nuys, CA
Original Publish Date:	September 1, 2004
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=57055