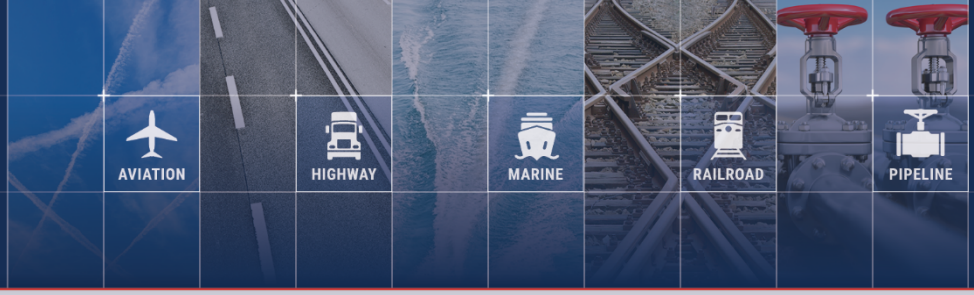

Aviation Investigation Final Report

Location:	China Lake, California	**Accident Number:**	LAX00GA185
Date & Time:	May 5, 2000, 10:15 Local	**Registration:**	N32229
Aircraft:	Beech 65-90	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious, 3 None
Flight Conducted Under:	Part 91: General aviation - Public aircraft		

Analysis

The twin-engine airplane experienced a loss of control after becoming entangled with a deploying parachute during cruise flight at 20,000 feet and 180 knots. The test flight was conducted to test an experimental parachute with a 331-pound anthropomorphic dummy that was rigged to the parachute. Two crewmembers in the airplane's cabin were to push the dummy out of the door and the parachute would deploy by pulling on a static line that was secured to a floor seat track. The static line for this flight had been reduced in length from 14 feet to 9 feet because of a previous test flight where a pin on the end of the static line became entangled with the elevator hinge and caused control problems. With the shortened static line, it was in tension when the dummy was positioned in the doorway. During the accident flight, once the dummy cleared the doorway, the static line deployed the pilot chute which in turn deployed the drogue chute. The drogue chute cleared the top of the left horizontal stabilizer while the dummy fell below. The dummy began oscillating and impacted the empennage and lower side of the horizontal stabilizer, eventually resulting in the partial separation and bending down of the stabilizer about midspan. As the dummy became entangled on the left horizontal stabilizer, the airplane made an uncommanded nose over into a negative G arc, which threw one crewmember about the cabin while the second crewmember was able to restrain himself by holding onto the static line. As the main parachute deployed, the drogue chute lines separated and the dummy and canopies fell away from the airplane. As the dummy fell away, the airplane pitched up and began an uncommanded roll to the right, stopping in a fully inverted attitude. The airplane initially nosed forward and then began a slow roll to the left, eventually stabilizing in wings level attitude. The pilots then returned the airplane to the airport and landed without further incident. Review of the parachute test program's Test Hazard Analysis revealed that the plan's cause/effect assessment and hazard mitigation actions inadequately addressed all potential "out of aircraft" hazard possibilities, including the effect of the parachute lines and/or dummy becoming entangled on the horizontal stabilizer. Additionally, no revision to the Test Hazard Analysis was noted after the previous static line entanglement incident and subsequent shortening of the static line.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the inadvertent early deployment of the test parachute lines and dummy and it's entanglement with the horizontal stabilizer, which resulted from the operator's inadequate test plan substantiation process for shortening the parachute's static line.

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Findings

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

Findings
1. (C) MISC EQPT/FURNISHINGS,PARACHUTE/DRAG CHUTE - INCORRECT
2. MAINTENANCE,ADJUSTMENT - PERFORMED - OTHER CREWMEMBER
3. (C) ACFT/EQUIP,INADEQUATE COMPLIANCE DETERMINATION - COMPANY/OPERATOR MANAGEMENT
4. (C) INADEQUATE SUBSTANTIATION PROCESS,INSUFF REVIEW - COMPANY/OPERATOR MGMT
5. (C) MISC EQPT/FURNISHINGS,PARACHUTE/DRAG CHUTE - ENTANGLED
6. (C) HORIZONTAL STABILIZER - BENT

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

Findings
7. AIRCRAFT CONTROL - NOT POSSIBLE

Factual Information

On May 5, 2000, at 1015 Pacific daylight time, a Beech King Air 65-90 twin-engine airplane, N32229, lost control during cruise flight after becoming entangled with a deploying parachute north of China Lake, California. The airplane sustained substantial damage and one crewmember received serious injuries. The pilot, copilot, and second crewmember were not injured. The airplane was registered to a private individual and was being operated as a public-use flight by Aerospace Equipment Research Organization (AERO), Wilmington, Delaware, under 14 Code of Federal Regulation Part 91 at the time of the accident. The local flight originated from Armitage Field, Naval Air Warfare Center, China Lake, at 0945. Visual meteorological conditions prevailed at the time of the accident and a military visual flight rules flight plan had been filed.

The crew was in the process of conducting an experimental parachute test with a 331-pound anthropomorphic dummy that was rigged with a main and reserve parachute. The parachute assembly consisted of a pilot chute (which is a spring-loaded canopy and deploys when a ripcord pin is extracted (in this case by a static line)), a drogue chute (which is a small canopy released prior to the main canopy to provide descent stabilization), and a main canopy parachute.

The accident sequence was filmed by several video cameras from different angles and perspectives, and National Transportation Safety Board investigators reviewed the footage.

While stabilized at 20,000 feet mean sea level (msl) and 180 knots, the two crewmembers in the back of the airplane positioned the dummy at the open cabin door. The static line was attached to a ring that, in turn, was secured by a line to the left outboard seat track, about 1-foot forward of the doorway. One crewmember crouched behind the dummy while the second knelt just forward of the open door with his hands on the static line.

As the dummy cleared the doorway, the pilot chute deployed. This was immediately followed by the deployment of the drogue chute. The drogue chute cleared the top of the left horizontal stabilizer while the dummy fell below. Initially, the dummy trailed behind the left elevator but as the drogue chute fully inflated, the dummy was drawn back underneath the horizontal stabilizer. At this point the dummy began oscillating, contacting the empennage and the lower side of the horizontal stabilizer. As the oscillations increased in magnitude, the left horizontal stabilizer began separating at about midspan, folding back on top of itself. At nearly the same moment, the soft link for the deployment of the main parachute separated and the main canopy deployed. Almost simultaneously, the drogue chute lines separated and the dummy fell freely from the airplane as the main canopy opened.

As the dummy became entangled on the left horizontal stabilizer, the airplane made an

uncommanded noseover into a negative G arc. The crouching crewmember was thrown about the cabin while the kneeling crewmember held onto the static line. As the dummy fell away, the airplane pitched up and began an uncommanded roll to the right, stopping in a fully inverted attitude. The airplane initially nosed forward and then began a slow roll to the left, stabilizing in level attitude. The pilot's then returned the airplane to the airport and landed without further incident.

An inspection of the airplane after the accident revealed that the static line had been shortened from 14 feet 6 inches to 7 feet 9 inches. Measurements from the static line attachment point further revealed that the static line was in tension with the dummy in the aircraft doorway. The installation aviation safety officer had been informed by test personnel that the static line had been intentionally shortened. This was due to an incident during a previous test in which a pin at the end of the static line had become lodged in the left elevator hinge. On April 21, 2000, the crew of another test flight experienced a situation where a pin at the end of the static line (originally 14 feet 6 inches) became lodged in the horizontal stabilizer control surface. The cabin crew was able to remove the static line from the control surface after several attempts by releasing the line and letting it trail behind the aircraft. The line and its pin were never recovered. After the April 21st event, the crew discussed the hazard with AERO and the parachute test program personnel and a decision was made to shorten the static line to a maximum length of 9 feet. The static lines were shortened and the test dummies were installed and underwent their final quality assurance (QA) check on May 4, 2000. According to one of the crewmembers, "throughout the entire chain of events, from the previous airdrop until after the final QA, it was agreed by all involved that the length of the static line (being too long) was a hazardous situation. From the time that we identified the length of the static line as a potential problem throughout the rigging and QA process I do not believe that anyone realized that there may have been a hazard induced from shortening the static line."

According to the Chief Test Pilot of the Navel Weapons Test Squadron, the parachute test program personnel did not obtain the proper approval for the test plan, specifically, the Chief Test Pilot requested that they address the "out of aircraft" hazards in the Test Hazard Analysis. According to the Test Hazard Analysis, approved on April 21, 2000, under the section titled 3. Test item strikes aircraft upon release," the cause, effect, assessment and mitigation of this particular hazard was addressed as follows:

"Cause- Aero forces cause test item to deviate from anticipated path and strike rear portions of aircraft."
"Effect- Since no antennas or other sensitive, protruding items are present, only minor cosmetic skin damage would likely result."
"Assessment- Based on prior experience the probability of this occurrence is low."
"Mitigation- Trained and briefed personnel will deploy the dummies aggressively to prevent subsequent aircraft contact."

There were no known changes to the Test Hazard Analysis after the April 21st event.

Pilot Information

Certificate:	Airline transport; Commercial; Flight engineer; Private	**Age:**	60,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Glider	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	April 26, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 17, 1998
Flight Time:	22874 hours (Total, all aircraft), 183 hours (Total, this make and model), 13761 hours (Pilot In Command, all aircraft), 62 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	31,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	February 16, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 9, 1998
Flight Time:	3200 hours (Total, all aircraft), 40 hours (Total, this make and model), 3000 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N32229
Model/Series:	65-90 65-90	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	LJ-49
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	February 15, 2000 Continuous airworthiness	**Certified Max Gross Wt.:**	9300 lbs
Time Since Last Inspection:	22.3 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	11749.4 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-6
Registered Owner:	Joe Crottwell	**Rated Power:**	500 Horsepower
Operator:	Aerospace Equipment Research Organization	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	NID,2283 ft msl	**Distance from Accident Site:**	
Observation Time:	09:56 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 8000 ft AGL	**Visibility**	35 miles
Lowest Ceiling:	Broken / 20000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	28°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	China Lake, CA (NID)	**Type of Flight Plan Filed:**	Military VFR
Destination:	(NID)	**Type of Clearance:**	IFR
Departure Time:	09:45 Local	**Type of Airspace:**	Military operation area

Airport Information

Airport:	China Lake NID	**Runway Surface Type:**	Concrete
Airport Elevation:		**Runway Surface Condition:**	Dry
Runway Used:	32	**IFR Approach:**	None
Runway Length/Width:	9011 ft / 200 ft	**VFR Approach/Landing:**	Full stop;Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 Serious, 3 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 3 None	**Latitude, Longitude:**	35.666667,-117.666664

Administrative Information

Investigator In Charge (IIC):	Crispin, Robert
Additional Participating Persons:	Frank L Motter; Federal Aviation Administration; Van Nuys, CA
Original Publish Date:	November 25, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=49151