Aviation Investigation Final Report

Location:	Poipu, Hawaii	**Accident Number:**	WPR11LA081
Date & Time:	December 22, 2010, 08:30 Local	**Registration:**	N157AP
Aircraft:	Apollo AS-III	**Aircraft Damage:**	Substantial
Defining Event:	Aircraft structural failure	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The special light sport weight-shift control aircraft, commonly referred to as a "trike," took off from its base on the island of Kauai, Hawaii, on a "discovery" flight. On board were the instructor-rated pilot and the passenger-student. According to the pilot, while in cruise flight about 45 minutes after takeoff, the aircraft became "extremely difficult" to control, and the fabric wing skin was "fluttering intensely" along its trailing edge. The pilot opted for a precautionary landing on a nearby golf course. During the landing roll, the aircraft tipped onto one wing.

Postlanding examination of the aircraft revealed that the fabric nose cone that was installed over the centerline juncture of the two wing leading edge tubes was damaged. The purpose of the nose cone was to prevent ram air from entering and inflating the wings during flight, which would change the wing profiles and result in controllability problems. The aircraft manufacturer indicated that the nose cone damage was primarily due to the nose cone being left in place when the wings were folded for transport or storage, a practice which was strongly discouraged by the manufacturer. In addition, although the manufacturer recommended against unprotected storage of the aircraft to preclude fabric deterioration from the elements, the pilot was known to store the aircraft outside on a regular basis. In combination, those practices by the pilot, which were contrary to the manufacturer's guidance, resulted in the degradation and eventual failure of the nose cone. With the aircraft on its wheels, the nose cone and upper surface of the wing were at least 8 feet above the ground, but there was no evidence that the operator or the accident pilot had or utilized a stepladder or other means to access and inspect the nose cone and wing upper surface before flight. The lack of equipment to conduct a thorough preflight inspection prevented timely detection of the deterioration of the nose cone.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's lack of compliance with manufacturer's guidance for care and handling of the aircraft combined with incomplete preflight inspections, which resulted in an undetected material failure of the nose cone.

Findings

Environmental issues	(general) - Contributed to outcome
Personnel issues	Decision making/judgment - Pilot
Aircraft	(general) - Incorrect service/maintenance

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Prior to flight	Aircraft inspection event
Enroute-cruise	Aircraft structural failure (Defining event)
Enroute-cruise	Flight control sys malf/fail
Landing-landing roll	Loss of control on ground

HISTORY OF FLIGHT

On December 22, 2010, about 0830 Hawaiian standard time, a special light sport (SLSA) weight-shift control Apollo Delta Jet AS-III aircraft, N157AP, was substantially damaged during landing rollout following an off-airport precautionary landing near Poipu, on the island of Kauai, Hawaii. The pilot and passenger were not injured. The instructional flight was marketed and coordinated by Big Sky Kauai (BSK). The accident pilot was the owner of the aircraft, and provided his aircraft and services to BSK on a contractual basis. The flight was conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. Visual meteorological conditions prevailed, and no flight plan was filed.

According to the pilot, he conducted a thorough preflight inspection, and did not notice anything abnormal. The accident aircraft and another AS-III from BSK took off from their base, Port Allen Airport (PAK), Hanapepe, Hawaii, about 0745. While in cruise flight with the other aircraft at an altitude of 3,000 feet, the pilot noticed unusual back pressure on the flight controls, and also noticed that the wing trailing edge was fluttering. In his written statement about the event, he said that at first he "felt as if the wing was entering a stall." Shortly thereafter, the wing became "extremely difficult to control… with very little pitch authority, and intense fluttering." Initially, he decided to return to PAK, but due to controllability problems, he opted to land on a golf course below. The pilot reported that the golf course grass was wet and uneven. During the rollout, the nose slewed to the right and the craft tipped onto its left wing, which fractured the wing leading edge tube just outboard of the wing strut. The other aircraft circled briefly to ensure that the two were uninjured, and then returned to PAK.

PERSONNEL INFORMATION

According to Federal Aviation Administration (FAA) information, the pilot held a sport pilot certificate with a limitation for weight-shift-control land, and a flight instructor certificate with a flight instructor sport rating, with a limitation for weight-shift-control. He was not issued an FAA medical certificate, nor was he required to possess one. The pilot reported a total flight experience of 525 hours, including 516 hours in the accident aircraft make and model.

AIRCRAFT INFORMATION

The aircraft was designed and manufactured by Apollo North America. According to the manufacturer, each aircraft could be customized with a variety of engine, wing, and other equipment options. The aircraft was a two-place weight-shift-control-land (WSCL) vehicle. The fuselage was a metal and composite structure, which contained the seats, controls, and engine, and was suspended from an aluminum tube fabric-skinned wing.

Each wing had an upper and lower skin. The manufacturer reported that the accident aircraft had an "Evolution Trikes Reflex 11 (Competition)" wing. The wing structure included two leading edge spar tubes that attached to a common fitting at their vertex. A fabric cover referred to as a "nose cone" affixed to this junction by Velcro strips. The purpose of the nose cone was to prevent ram air from entering the wings during flight, which would "inflate" them, and thereby change their upper and lower surface profiles. Storage and transport was facilitated by a folding wing design; with some disassembly, the two wing leading edge spar tubes could be pivoted on their common vertex fitting, allowing the two spars to be folded aft. The manufacturer's guidance required that the nose cone be removed for wing folding. A video on the manufacturer's web site demonstrated how to fold the wing, and indicated that the process required about 8 minutes.

The aircraft was equipped with a 100 hp Rotax engine, and tricycle-arrangement wheel landing gear. These WSCL aircraft are commonly referred to by manufacturers and operators as "trikes." Due to their design and construction materials, trikes are more susceptible to the effects of weather (ultraviolet radiation, corrosion, wind) than conventional aircraft, and are best stored in a protective environment (hangar, trailer, etc.) when not in use. The manufacturer's maintenance and inspection guidance contained specific information regarding the care and inspection of the fabric covering material and stitching.

The aircraft was based at PAK. When the aircraft was resting on its wheels, the nose cone and upper surface of the wing were at least 8 feet above the ground. There was no evidence that BSK or the accident pilot either possessed or utilized a stepladder or other means to access and inspect the nose cone and wing upper surface.

METEOROLOGICAL INFORMATION

The automated weather observation taken about the time of the accident at an airport located about 8 miles northeast of the accident location, included west winds of 3 knots; 10 miles visibility; scattered clouds at 2,000 feet; and a temperature of 21 degrees C.

AIRPORT INFORMATION

BSK based its flights and kept its single trike at Port Allen Airport (PAK), as did the accident pilot. According to the FAA Airport/Facility Directory (AFD), PAK was equipped with a single paved runway that measured 2,450 feet by 60 feet. There was "No airfield security," and overnight aircraft parking was "not authorized." The airport had only one hangar, and no fuel or maintenance services.

The FAA inspector assigned to this accident was familiar with the airport, BSK, the accident pilot, and two other trike operators at the airport. He stated that one trike operator leased space in the one hangar, while the other operator "packs his [aircraft] into his trailer and takes it home everyday." In contrast, BSK and the accident pilot typically left their aircraft tied down on the PAK ramp day and night unless they were specifically asked to remove them. The inspector added that the week before the accident, severe storms struck PAK, and that he was "almost certain" that the accident aircraft was tied down outside when the storms struck.

WRECKAGE AND IMPACT INFORMATION

Post-accident examination of the aircraft by an FAA inspector revealed that in addition to the left wing damage caused by ground impact, the fabric nose cone that installed over the centerline juncture of the two wing leading edge tubes was damaged. That damage was not consistent with impact damage from the accident, and no other pre-impact mechanical anomalies were observed.

Photographs of the damaged nose cone were provided to the manufacturer. The manufacturer categorized the damage as unusual and "disturbing." The manufacturer ascribed the nose cone damage to repeated folding of the wing with the nose cone still installed. The manufacturer reported that the nose cone damage adversely affected the functionality of the nose cone, and allowed ram air to enter and inflate the wings, which resulted in the pilot's control problems.

ORGANIZATIONAL AND MANAGEMENT INFORMATION

Big Sky Kauai was owned by Mr. James Gaither. Mr. Gaither piloted flights for Big Sky Kauai in another trike owned by a third individual. According to the accident pilot, he (the accident pilot) was not an owner or direct employee of BSK. Instead, he contracted his piloting services in his aircraft with BSK on an hourly basis.

In February 2011, Mr. Gaither and a passenger received fatal injuries in a separate BSK trike accident. News media information indicated that BSK was no longer in business subsequent to that accident.

ADDITIONAL INFORMATION

Use of SLSA Aircraft for Revenue Sightseeing

FAA regulations prohibit the use of SLSA aircraft for revenue sightseeing flights. Several operators in Hawaii, including BSK and the accident pilot, utilized SLSA aircraft to conduct introductory flights, which they termed "discovery" flights. The flights were advertised and marketed as sightseeing flights, but the flight documentation referred to them as instructional flights.

Shortly after the accident, the BSK web site was reviewed, and the following statements were excerpted from that web site:
- "Big Sky Kauai provides powered hang glider tours of Kauai that rate better and safer then helicopter tours. Fly the island in our ultralight".
- "Big Sky Kauai is the #1 activity for all of Kauai…go to: TripAdvisor.com for more information"
- "Our flights will take you over all the beauty and wonder that Kauai has to offer. From Kauai's incredible landscapes to its towering waterfalls, lush forests, and the awesome Napali coastline."
- "Big Sky Kauai is the only Air Adventure that offers Sunset Flights. Check out our special pricing for this incredible visual experience."

According to the FAA inspector, the operators "are conducting flight tours under the guise of flight instruction," and the operators' "flight records show hundreds of flights listed" as introductory flights. He noted that there was no follow-up training, or any repeat students. He further stated that the operators did not conduct any ground school training, nor did they have the facilities to do so. He closed by stating that PAK was not a good training environment "due to high winds and rapidly changing weather."

According to the inspector, these types of operations were common knowledge to inspectors at the Honolulu Flight Standards District Office (HNL FSDO). The HNL FSDO maintained files on those operators, and attempted to monitor them. However, because the operators were not certificated revenue sightseeing flight providers, limited FSDO resources constrained the ability of the inspectors to conduct regular surveillance on those operators, including BSK and the accident pilot.

According to a manager at the HNL FSDO, the FSDO formed an "Air Tour Unit" to conduct oversight of those operations. They conduct an annual safety meeting with all the LSA operators in the State of Hawaii to address the following:

- A review of the LSA regulations
- A review of the past incidents and accidents
- A review of any safety trends
- Open discussion of any safety concerns

The most recent annual meeting was conducted on April 25, 2012.

Pilot Information

Certificate:	Sport Pilot	**Age:**	28,Male
Airplane Rating(s):	None	**Seat Occupied:**	Front
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	Sport pilot	**Toxicology Performed:**	No
Medical Certification:	Sport pilot	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	525 hours (Total, all aircraft), 516 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Apollo	**Registration:**	N157AP
Model/Series:	AS-III	**Aircraft Category:**	Weight-shift
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Special light-sport (Special)	**Serial Number:**	8
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	1040 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Rotax
ELT:		**Engine Model/Series:**	912ULS
Registered Owner:	MAC LLC	**Rated Power:**	100 Horsepower
Operator:	Big Sky Kauai	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LIH,153 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	45°
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	260°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.95 inches Hg	**Temperature/Dew Point:**	21°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hanapepe, HI (PAK)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	07:45 Local	**Type of Airspace:**	

Airport Information

Airport:	Port Arthur PAK	**Runway Surface Type:**	
Airport Elevation:	24 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	21.870832,-159.447784(est)

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Lance Johnson; FAA FSDO; Honolulu, HI Charles Cantu; FAA FSDO; Honolulu, HI
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