Aviation Investigation Final Report

Location:	Ionia, Michigan	**Accident Number:**	CEN17LA057
Date & Time:	December 16, 2016, 10:45 Local	**Registration:**	N812C
Aircraft:	Stinson 108-3	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot reported that, shortly after takeoff from a snow-covered runway, he heard a "thump" and saw that the left main landing ski tip had rotated up, past vertical, and was in contact with the left wing strut. He was unable to reposition the left ski into a normal position. Upon landing, the ski separated from the axle, the left gear leg dug into the snow, and the airplane rapidly decelerated before it nosed over.

As designed, the main landing skis are supported by two 5/32-in braided steel cables and bungee/shock cords. Both ends of the steel cables terminate with a thimble-eye and a compressed/swaged nicopress sleeve. On the accident airplane, the forward and aft support cables had pulled through their respective nicopress sleeves where the cables attached to the left ski's tip and tail. The nicopress sleeves for the left ski tip and tail attachments were not located during the investigation. However, a postaccident examination of the remaining nicopress sleeves established that they were likely improperly formed with a 3/16-in swage tool instead of a properly-sized 5/32-in tool. As a result, the steel support cables were able to pull through the inadequately-formed nicopress sleeves during the accident flight. It is likely that the aft support cable pulled through its nicopress sleeve during takeoff, which allowed the ski to rotate into a vertical position. The forward support cable likely pulled through its nicopress sleeve when the left ski separated from the axle during the subsequent landing.

The pilot reported that the airplane was typically equipped with snow skis during the winter. He purchased the main landing skis in used condition, with an undocumented service history, from an individual about 8 years before the accident. The forward and aft support cables were already fabricated and installed on the skis when they were purchased. Additionally, the pilot reported that the support cables had not been repaired or replaced since he owned the skis. The pilot, who was also an aviation mechanic, installed the main landing skis for the winter snow season 2 days before the accident. The accident occurred during the first flight since the skis were installed for the season.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A failure of the aft support cable on the left main landing ski due to an inadequately formed nicopress sleeve, which allowed the ski to rotate into a vertical position shortly after liftoff, and its unavoidable separation during the subsequent landing.

Findings

Personnel issues	Fabrication - Maintenance personnel
Aircraft	Wheel/ski/float - Incorrect service/maintenance
Aircraft	Fasteners - Incorrect service/maintenance
Aircraft	Wheel/ski/float - Failure
Aircraft	Directional control - Attain/maintain not possible

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Takeoff	Sys/Comp malf/fail (non-power) (Defining event)
Landing	Part(s) separation from AC
Landing	Loss of control on ground
Landing	Nose over/nose down

On December 16, 2016, about 1045 eastern standard time, a Stinson model 108-3 single-engine airplane, N812C, equipped with snow skis, was substantially damaged while landing at Ionia County Airport (Y70), Ionia, Michigan. The private pilot, the sole occupant, was not injured. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Day visual meteorological conditions prevailed for the flight that departed Lowell City Airport (24C), Lowell, Michigan, about 1030.

The pilot reported that shortly after takeoff from a snow covered runway he heard a thump and saw that the left main landing ski tip had rotated up, past vertical, and was in contact with the left wing strut. He decided to land at nearby Y70 because he anticipated requiring assistance upon landing and the departure airport was unmanned. Additionally, Y70 had a snow covered turf runway, south of the paved runway 9/27, that was typically used for glider operations. The pilot reported that he was unable to reposition the left ski into a normal position and upon landing the ski separated from the axle, the left gear leg dug into the snow, and the airplane rapidly decelerated before it nosed over. The right wing, left wing strut, and vertical stabilizer were substantially damaged during the accident.

As designed, the main landing skis are supported by two 5/32 inch braided steel cables and bungee/shock cords. Both ends of the 5/32 inch steel cables terminate with a thimble-eye and a compressed/swaged plain copper oval nicopress sleeve (No. 18-4-P). On the accident airplane, the forward and aft support cables had pulled through their respective nicopress sleeves where the cables attached to the left ski's tip and tail. The nicopress sleeves for the left ski tip and tail attachments were not located during the investigation. However, a visual examination of the remaining nicopress sleeves, located where the support cables attached to the left landing gear leg, appeared to be inadequately compressed. Additionally, a visual inspection of the right main landing ski cables also revealed inadequately compressed nicopress sleeves. The width of the remaining nicopress sleeves, as measured with a dial-caliper, were between 0.440 and 0.446 inch.

According to manufacturer specifications, when properly formed, the width of a 5/32 inch nicopress sleeve should be less than 0.395 inch. A test cable eye was fabricated using 5/32 inch braided steel cable and two plain copper oval nicopress sleeves (No. 18-4-P). The first nicopress sleeve was compressed using a proper 5/32 inch swage tool. The other test sleeve was compressed using a larger 3/16 inch swage tool. The width of the properly formed test sleeve, using a 5/32 swage tool, measured 0.383-0.386 inch. The width of the other test sleeve, using a 3/16 swage tool, measured 0.442-0.452 inch.

The pilot reported that the airplane was typically equipped with snow skis during the winter snow seasons. In February 2009, he purchased the main landing skis, Federal Aircraft Works model A-2500A, from a private individual. The skis were purchased used, with an undocumented service history. The skis were acquired as complete assemblies, which included all cables, bungees, brackets, and hardware appropriate for a Stinson model 108-3 installation. The forward and aft support cables were already fabricated and installed on the skis when they were purchased. Additionally, the pilot reported that the support cables had not been repaired or replaced since he owned the skis.

On December 14, 2016, the pilot, who was also an aviation mechanic, installed the main landing skis for the 2016/17 winter snow season. According to an airframe logbook entry, the main landing skis were installed per manufacturer's drawing No. 11R955/AB. The accident occurred during the first flight since the skis were installed for the season.

Pilot Information

Certificate:	Private	**Age:**	64,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	April 28, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 23, 2015
Flight Time:	2718 hours (Total, all aircraft), 1884 hours (Total, this make and model), 25 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Stinson	**Registration:**	N812C
Model/Series:	108-3	**Aircraft Category:**	Airplane
Year of Manufacture:	1947	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	108-3812
Landing Gear Type:	Tailwheel; Ski	**Seats:**	4
Date/Type of Last Inspection:	November 11, 2016 Annual	**Certified Max Gross Wt.:**	2500 lbs
Time Since Last Inspection:	6 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4125.51 Hrs at time of accident	**Engine Manufacturer:**	Franklin
ELT:	C91 installed, not activated	**Engine Model/Series:**	6A-335-B1A
Registered Owner:	On file	**Rated Power:**	180 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:	Y70,818 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	10:34 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 3300 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 10000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.26 inches Hg	**Temperature/Dew Point:**	-10°C / -13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Lowell, MI (24C)	**Type of Flight Plan Filed:**	None
Destination:	Ionia, MI (Y70)	**Type of Clearance:**	None
Departure Time:	10:30 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Ionia County Airport Y70	**Runway Surface Type:**	Snow
Airport Elevation:	818 ft msl	**Runway Surface Condition:**	Snow
Runway Used:	27	**IFR Approach:**	None
Runway Length/Width:	4298 ft / 75 ft	**VFR Approach/Landing:**	Traffic pattern

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:**	42.938056,-85.060554(est)

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Thomas G Kozura; Federal Aviation Administration, Grand Rapids FSDO; Grand Rapids, MI
Original Publish Date:	March 6, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=94514