



# National Transportation Safety Board

## Aviation Accident Data Summary

<b>Location:</b>	Middletown, DE	<b>Accident Number:</b>	ERA12LA493
<b>Date &amp; Time:</b>	08/01/2012, 0900 EDT	<b>Registration:</b>	N126GW
<b>Aircraft:</b>	SIKORSKY S-58JT	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 133: Rotorcraft Ext. Load		

### Analysis

The pilot had flown two uneventful external load lifts to place 2,900-lb air conditioning units on a warehouse roof. The pilot reported that, during the third lift, he felt vibration in the pedals that became violent, and the helicopter then began to rotate about its vertical axis. The air conditioning unit touched down on the roof as the helicopter was spinning. The pilot could not stop the helicopter's rotation, so he released the cable attached to the air conditioning unit and then maneuvered the helicopter away from the warehouse. He then increased forward speed, turned right to line up with a street, and conducted a roll-on landing.

Examination of the helicopter revealed that the entire aft portion of one of the four tail rotor blades had separated just aft of the blade's spar where a bond line existed. Examination of the tail rotor blade revealed high-stress progressive crack growth features at the root end of the fracture, buckling deformation adjacent to the fracture, and bending deformation of the leading edge, all of which were consistent with the tail rotor blade fracturing due to dynamic instability in the tail rotor. The progressive crack growth features observed on the fracture surface were associated with relatively high stress and few cycles and likely occurred after the deformation associated with the buckling. In addition, all four tail rotor blades exhibited bending deformation, indicating that they all experienced loads that exceeded the allowable design loads, and the deformation pattern was consistent with an external input on the tail rotor assembly overloading all of the blades rather than a failure in the blade causing it to become unstable. The helicopter manufacturer confirmed that such damage can be caused by dynamic tail rotor instability and that such instability can be accompanied by tail rotor vibration, as was experienced during the accident flight.

Although dynamic tail rotor instability rarely occurs, it has been known to occur on the accident helicopter make and model. To improve tail rotor stability, the helicopter manufacturer had introduced two modifications to the tail rotor system, and both of these modifications had been installed on the accident helicopter. Even with the modifications, dynamic tail instability can occur, and high values of left pedal, improper tail rotor cable tension (too high or too low), bottoming of the tail rotor control system spring, higher rotor speed, or relative wind from the right forward quadrant could increase susceptibility. However, a review of the helicopter's maintenance records did not reveal that any of the mechanical factors that could contribute to tail rotor instability existed, and wind was calm at the time of the accident. Additionally, after the damaged components were replaced, the helicopter was returned to service. The helicopter's flight manual also contained guidance stressing that pilots should immediately decrease the tail rotor pitch after encountering pedal vibration. If the pilot had recognized that the pedal vibration was indicative of tail rotor instability and immediately taken the proper corrective actions in accordance with this guidance, the accident might have been prevented.

### Flight Events

Maneuvering-hover - Miscellaneous/other  
 Maneuvering-hover - Sys/Comp malf/fail (non-power)  
 Maneuvering-hover - Part(s) separation from AC  
 Autorotation - Off-field or emergency landing

### Probable Cause

The National Transportation Safety Board determines the probable cause(s) of this accident to be:  
 The pilot's failure to recognize that the helicopter was experiencing tail rotor dynamic instability and to take immediate corrective actions during an external load lift, which resulted in the failure of a tail rotor blade.

### Findings

Aircraft-Aircraft propeller/rotor-Tail rotor-Tail rotor blade-Capability exceeded - C  
 Aircraft-Aircraft propeller/rotor-Tail rotor-Tail rotor blade-Failure - C  
 Personnel issues-Action/decision-Action-Incorrect action performance-Pilot - C

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	65
<b>Airplane Rating(s):</b>	None	<b>Instrument Rating(s):</b>	Helicopter
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Instructor Rating(s):</b>	None
<b>Flight Time:</b>	16500 hours (Total, all aircraft), 7000 hours (Total, this make and model), 16500 hours (Pilot In Command, all aircraft), 125 hours (Last 90 days, all aircraft), 50 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

### Aircraft and Owner/Operator Information

<b>Aircraft Manufacturer:</b>	SIKORSKY	<b>Registration:</b>	N126GW
<b>Model/Series:</b>	S-58JT	<b>Engines:</b>	1 Turbo Shaft
<b>Operator:</b>	AIRCRAVE INC	<b>Engine Manufacturer:</b>	PWC
<b>Air Carrier Operating Certificate:</b>	Rotorcraft External Load (133)	<b>Engine Model/Series:</b>	PT6T-6
<b>Flight Conducted Under:</b>	Part 133: Rotorcraft Ext. Load		

### Meteorological Information and Flight Plan

<b>Observation Facility, Elevation:</b>	ILG, 80 ft msl	<b>Weather Information Source:</b>	Weather Observation Facility
<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Lowest Ceiling:</b>	None
<b>Condition of Light:</b>	Day	<b>Wind Speed/Gusts, Direction:</b>	Calm
<b>Temperature:</b>	23°C / 22°C	<b>Visibility</b>	8 Miles
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Middletown, DE (None)	<b>Destination:</b>	Middletown, DE (None)

## Airport Information

Airport:	Parking Lot (None)	Runway Surface Type:	Asphalt
Runway Used:	N/A	Runway Surface Condition:	Dry
Runway Length/Width:			

## Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None

## Administrative Information

Investigator In Charge (IIC):	Todd G Gunther	Adopted Date:	08/11/2015
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	<a href="http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=84540">http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=84540</a>		

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