



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Fresno, California	<b>Accident Number:</b>	WPR14TA248
<b>Date &amp; Time:</b>	June 15, 2014, 20:44 Local	<b>Registration:</b>	N4692A
<b>Aircraft:</b>	Lockheed SP 2H	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Landing gear collapse	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Public aircraft		

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## Analysis

The captain reported that, while returning to the departure airport following an uneventful aerial drop, he noticed that the hydraulic pressure gauge indicated 0. The first officer subsequently verified that the sight gauge for the main hydraulic fluid reservoir was empty. The flight crew began performing the emergency gear extension checklist and verified that the nosewheel landing gear was extended. The captain stated that the first officer then installed the pin in the nosewheel landing gear as part of the emergency checklist. As the flight crewmembers diverted to a nearby airport because it had a longer runway and emergency resources, they briefed the no-flap landing. The first officer extended the main landing gear using the emergency gear release, which resulted in three down-and-locked landing gear indications. Subsequently, the airplane landed normally; however, during the landing roll, the nosewheel landing gear collapsed, and the airplane then came to rest nose low.

Postaccident examination of the airplane revealed that the nosewheel landing gear pin was disengaged from the nosewheel jury strut, and the pin was not located. The disengagement of the pin allowed the nosewheel landing gear to collapse on landing. It could not be determined when or how the pin became disengaged from the jury strut. Installation of the pin would have required the first officer to maneuver in a small area and install the pin while the nose landing gear door was open and the gear extended. Further, the pin had a red flag attached to it. When inserted during flight, the flag encounters a high amount of airflow that causes it to vibrate; this could have resulted in the pin becoming disengaged after it was installed.

Evidence of a hydraulic fluid leak was observed around the right engine cowling drain. The right engine hydraulic pump case was found cracked, and the backup ring was partially extruded, which is consistent with hydraulic system overpressurization. The reason for the overpressurization of the hydraulic system could not be determined during postaccident examination.

## Probable Cause and Findings

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

The collapse of the nosewheel landing gear due to the disengagement of the nosewheel landing gear pin. Contributing to the accident was the failure of the main hydraulic system due to overpressurization for reasons that could not be determined during postaccident examination of the airplane.

### Findings

<b>Aircraft</b>	Nose/tail landing gear - Not specified
<b>Aircraft</b>	Hydraulic, main system - Failure
<b>Not determined</b>	(general) - Unknown/Not determined

# Factual Information

## History of Flight

Enroute-cruise	Sys/Comp malf/fail (non-power)
Landing-landing roll	Landing gear collapse (Defining event)

On June 15, 2014, about 2044 Pacific daylight time, a Lockheed SP-2H, N4692A, was substantially damaged when the nose wheel landing gear collapsed during landing roll at the Fresno Yosemite International Airport (FAT), Fresno, California. The airplane was registered to Minden Air Corporation, Minden, Nevada, and operated as Tanker 48 by the United States Department of Agriculture (USDA), Forestry Service, under the provisions of Title 14 Code of Federal Regulations Part 137. The airline transport pilot (ATP) rated captain and the ATP rated first officer were not injured. Visual meteorological conditions prevailed, and a company flight plan was filed for the local firefighting flight. The flight originated from Porterville Municipal Airport (PTV), Porterville, California, at 1934.

The captain reported that following an uneventful aerial drop, the flight was returning to PTV. During the descent check, he noticed that the hydraulic pressure indicated 0 and that the first officer subsequently verified that the sight gauge for the main hydraulic fluid reservoir was empty. The first officer opened the jet engine doors successfully as the captain selected gear down with no response. The captain notified base personnel at PTV of the situation, and informed them that they would be orbiting to the east of the airport to troubleshoot. The captain and first officer performed the emergency checklist, and verified that the nose wheel landing gear was extended. The captain stated that the first officer then installed the pin in the nose wheel landing gear as part of the emergency checklist.

The flight diverted to FAT due to a longer runway and emergency resources as both pilots briefed the no-flap landing procedure, airspeeds, and approach profile. As the flight continued toward FAT, the flight crew informed Fresno Approach Control of the hydraulic system failure, and continued to perform the emergency gear extension checklist. The first officer extended the main landing gear using the emergency gear release, which resulted in three down and locked landing gear indications in the cockpit. As the flight neared FAT, the first officer added 2 gallons of hydraulic fluid to the main hydraulic reservoir while the captain attempted to extend the flaps unsuccessfully. Subsequently, the flight landed normally on runway 26R. During the landing roll, the nose wheel landing gear collapsed, and the airplane came to rest nose low.

The first officer reported that following completion of the emergency nose gear extension checklist, he physically inserted the nose gear pin in place prior to the landing at FAT.

Examination of the airplane by representatives from the Forest Service revealed that the forward portion of the fuselage was structurally damaged. The airplane was recovered to a secure location for further examination.

## Pilot Information

<b>Certificate:</b>	Airline transport; Commercial; Flight instructor	<b>Age:</b>	64
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	December 10, 2013
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	14410 hours (Total, all aircraft), 2010 hours (Total, this make and model), 13336 hours (Pilot In Command, all aircraft)		

## Co-pilot Information

<b>Certificate:</b>	Airline transport; Commercial	<b>Age:</b>	39
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Glider	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	February 11, 2013
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	5100 hours (Total, all aircraft), 2650 hours (Pilot In Command, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Lockheed	<b>Registration:</b>	N4692A
<b>Model/Series:</b>	SP 2H H	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1961	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Restricted (Special)	<b>Serial Number:</b>	148357
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	May 13, 2014 Continuous airworthiness	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>	29 Hrs	<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	10484 Hrs at time of accident	<b>Engine Manufacturer:</b>	Wright
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	R3350-32WA
<b>Registered Owner:</b>		<b>Rated Power:</b>	
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	Agricultural aircraft (137)

The accident airplane was manufactured in 1959 as an SP-2H Neptune. On April 18, 2002 it was issued a Special Airworthiness Certificate in the Restricted Category, for Forest and Wildlife Conservation. At the time of the accident, the airframe total time was 10,431.9 hours, of which 2,617.7 hours were as an air tanker.

The airplane's main hydraulic system is 3,000 psi system powered by two engine driven hydraulic pumps. A 1,500 psi emergency hydraulic power system for extending the nose landing gear, and operating the brakes and varicam is provided by an electrical hydraulic pump. As part of the retardant tank modification, an additional electric auxiliary pump was installed, which was capable of pressurizing the main hydraulic system to 3,000 psi.

The landing gear emergency extension checklist states the following items should be performed:

1. Normal landing gear circuit breaker pull
2. Airspeed below 155 KTS
3. Gear handle down
4. Emergency nose gear switch down
5. Nose gear pin install
6. Emergency nose gear switch off
7. MLG emergency release pulled

The nose gear pin is a steel pin, which has a retaining bearing at the end of the pin. The top of the pin is pressed, which allows for the bearing to become disengaged, and allows removal of the pin. In addition, the button portion of the pin has a ring with a red flag attached.

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Dusk
Observation Facility, Elevation:	KFAT, 327 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	03:53 Local	Direction from Accident Site:	318°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	Broken / 15000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	13 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	290°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.72 inches Hg	Temperature/Dew Point:	26° C / 6° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Porterville, CA (PTV )	Type of Flight Plan Filed:	Company VFR
Destination:	Porterville, CA (PTV )	Type of Clearance:	VFR
Departure Time:	19:34 Local	Type of Airspace:	Class C

## Airport Information

Airport:	FRESNO YOSEMITE INTL FAT	Runway Surface Type:	Asphalt
Airport Elevation:	335 ft msl	Runway Surface Condition:	Dry
Runway Used:	29R	IFR Approach:	None
Runway Length/Width:	9539 ft / 150 ft	VFR Approach/Landing:	Full stop; Straight-in

## Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	36.773056, -119.711112

## Tests and Research

Examination of the airplane by US Forest Service personnel revealed evidence of hydraulic fluid

leakage from the right engine cowling drain. Examination of the right engine accessory pad revealed that two of the eight bolts attaching the hydraulic pump were separated. Hydraulic fluid was observed puddled in the lower cowling, and residual fluid was found on components in the vicinity to the hydraulic pump. The system was pressurized with the auxiliary pump, and no apparent leaking lines or fittings were noted. The engine was motored utilizing the starter, and fluid was observed dripping off the bottom of the hydraulic pump.

The nose gear pin was not located during the postaccident examination of the airplane. It could not be determined how or when the nose gear pin became disengaged from the nose gear jury strut.

According to US Forest Service personnel, the installation of the nose gear pin is a critical step to be completed for a landing with a main hydraulic system failure. If not performed, the nose landing gear will collapse on touchdown. The installation of the pin requires a pilot to climb down into the nose landing gear wheel well that is located below the cockpit flight deck. While space is limited and it is difficult to maneuver within this area, the pin is installed while the nose landing gear door is already open and the gear is extended.

The hydraulic pump was a Stratopower Variable Delivery pump manufactured by The New York Air Brake Company, part number 66YD300, serial number DO-39. It was overhauled by Thunder Airmotive, Inc., on May 3, 2010, and installed on the accident airplane February 20, 2013. The hydraulic pump accumulated a total of 362.5 hours since overhaul at the time of the accident. The most recent inspection performed in the accessory area of the right engine was a 50 hour inspection, completed on May 23, 2014, about 30.8 hours prior to the accident.

Examination of the hydraulic pump was conducted at the facilities of Mark Air Motive, Moses Lake, Washington, under the supervision of the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on December 18, 2014. Examination of the pump revealed that the outer portion of the case was cracked. The hydraulic pump drive shaft rotated by hand. The pump was disassembled, and all internal components were intact and unremarkable. The backup ring was found partially extruded from the pump housing, which the technician stated was consistent with an over pressurization event of the hydraulic system.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cawthra, Joshua
<b>Additional Participating Persons:</b>	David Gage; Federal Aviation Administration; Fresno, CA Eric Shamboa; United States Forest Service; Boise, ID John K Hamilton; United States Forest Service; Boise, ID Gilbert A Elmy; United States Forest Service; Boise, ID
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<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89449">https://data.nts.gov/Docket?ProjectID=89449</a>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).