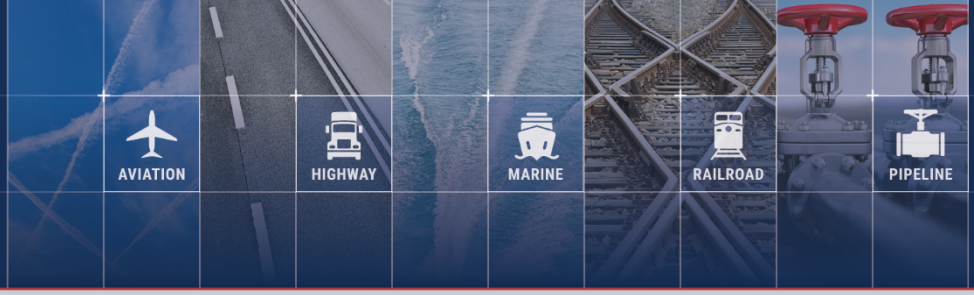

Aviation Investigation Final Report

Location:	Kekaha, Hawaii	**Accident Number:**	ANC22FA018
Date & Time:	February 22, 2022, 10:20 Local	**Registration:**	N615CK
Aircraft:	Sikorsky S-61N	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The accident helicopter was under contract to the United States Navy. The mission for the accident flight involved locating a training torpedo in the open waters, retrieving the torpedo using a recovery basket/cage system, then returning the torpedo to Pacific Missile Range Facility (PMRF) by sling load.

According to automatic dependent surveillance-broadcast (ADS-B) data, after the helicopter departed, it proceeded north-northwest to an area about 44 miles away. After maneuvering in the area, the helicopter proceeded south-southeast to return to PMRF. As the helicopter approached the facility, it crossed the shoreline and began a shallow left turn as it maneuvered to the north, into the prevailing wind. As the helicopter neared the predetermined drop-off site, the left turn stopped, and the helicopter proceeded in a northeasterly direction.

Multiple witnesses located near the accident site reported that as the helicopter continued the left turn towards the drop-off site, the turn stopped, and it began to travel in a northeast direction. The witnesses noted that as the helicopter flew about 200 ft above the ground, it gradually pitched nose down and impacted nose first, in a near-vertical attitude.

An examination of the wreckage revealed the flight control fore/aft servo input link remained connected at its clevis end to the flight control fore/aft bellcrank, located adjacent to the main gearbox. However, the rod end was partially connected to the fore/aft servo input clevises and its bolt had mostly backed out of its normally installed position. The bolt exhibited no evidence of fractures or visible deformation and its threads exhibited no unusual wear. Therefore, the bolt likely backed out of its normally installed position during the accident flight due to the absence of its nut and cotter pin. This would have caused an uncommanded input to the

fore/aft servo, resulting in the helicopter's nose-down attitude, and the inability of the crew to control the pitch attitude of the helicopter.

The fore/aft primary servo was installed on December 28, 2021. About 7.5 flight hours had elapsed from the time the fore/aft primary servo was installed until the day of the accident. The mechanic who installed the fore/aft servo input link to the fore/aft primary servo likely failed to correctly install the attaching hardware. The company's certified inspector and who oversaw and inspected all of the work at completion, failed to ensure the hardware attaching the fore/aft servo input link to the fore/aft primary servo was installed correctly.

Probable Cause and Findings

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

The improper installation of the fore/aft primary servo by maintenance personnel, which resulted in the attaching hardware backing out and which subsequently rendered the helicopter uncontrollable. Contributing to the accident was the company's quality control personnel to identify the improper installation before certifying the helicopter for flight.

Findings

Organizational issues	Oversight of maintenance - Maintenance provider
Personnel issues	Post maintenance inspection - Maintenance personnel
Personnel issues	Installation - Maintenance personnel

Factual Information

History of Flight

Landing	Loss of control in flight (Defining event)

On February 22, 2022, about 1020 Hawaii-Aleutian Standard Time, a Sikorsky S-61N helicopter, N615CK, was destroyed when it was involved in an accident at the Pacific Missile Range Facility (PMRF), Barking Sands, Kekaha, Hawaii, on the island of Kauai. The two pilots and two crewmembers were fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 133 flight.

The accident helicopter, owned and operated by Croman Corporation, was under contract to the United States Navy, being used to retrieve inert training torpedoes from the Pacific Ocean as part of the Navy's ongoing, Pacific submarine training operations. According to the director of operations for the operator, the accident mission involved locating a training torpedo in the open waters, retrieving the torpedo using a recovery basket/cage system, then returning the torpedo to PMRF by sling load.

The helicopter was one of two helicopters stationed at a hangar in PMRF Barking Sands. At the time of the accident, three mechanics were located at PMRF Barking Sands to maintain the two helicopters.

The helicopter was equipped with ADS–B, which provided aircraft tracking to determine its position via satellite navigation or other sensors and periodically broadcasts it, enabling it to be tracked. The information can be received by air traffic control ground stations as a replacement for secondary surveillance radar, as no interrogation signal is needed from the ground.

According to archived Federal Aviation Administration ADS-B data, after the helicopter departed PMRF, it proceeded north-northwest to an area about 44 miles away. After maneuvering in the area, the helicopter proceeded south-southeast towards PMRF to return to the facility. As the helicopter approached PMRF, it crossed the shoreline and began a shallow left turn as it maneuvered to the north, into the prevailing wind. As the helicopter neared the predetermined drop-off site, known as the ordnance recovery clear area (ORCA), the left turn stopped, and the helicopter proceeded in a northeasterly direction before the data ended.

Multiple witnesses located near the accident site consistently reported that as the helicopter continued the left turn towards the ORCA, the turn stopped, and it began to travel in a northeast direction. The witnesses noted that as the helicopter flew about 200 ft above the ground, it gradually pitched nose down and impacted nose first, in a near-vertical attitude.

Figure 1. N615CK at accident site

The helicopter came to rest on its left side on a heading of about 230° magnetic. Three ground scars consistent with main rotor blade impact marks were present near the initial airframe ground impact location. The nose bay door for avionics was found near the start of the debris trail, followed by pieces of debris from the cockpit structure and cockpit instruments, and then the remainder of the helicopter. The initial ground impact mark and debris trail leading up to the main wreckage was oriented about 65° magnetic. A postcrash fire consumed most of the cockpit and the cabin, though remnant frame sections were present near the main (forward) landing gear as well as the transmission deck. The cockpit voice recorder was found near the forward end of the main wreckage.

The main transmission gearbox remained whole and installed on the airframe. The main gearbox exterior was coated in soot from the postcrash fire but was not consumed by the postcrash fire.

The main rotor blades exhibited considerable fragmentation, with numerous fragments of main rotor blades found throughout the vicinity of the accident site.

An examination of the wreckage revealed that the flight control fore/aft servo input link remained connected at its clevis end to the flight control fore/aft bellcrank, located adjacent to the main gearbox. The rod end was partially connected to the fore/aft servo input clevises, but

the attaching hardware had mostly backed out of its normally installed position and the bolt was cocked (Figure 2).

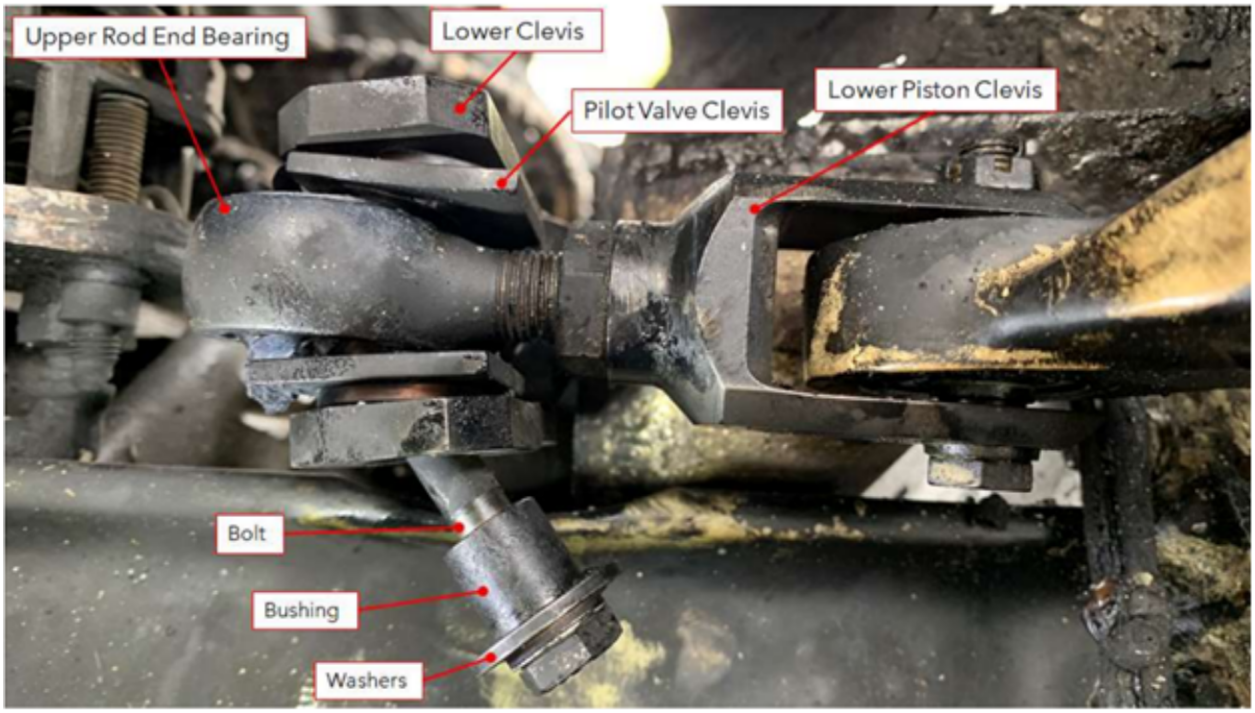

Figure 2. Fore/Aft Primary servo N615CK at accident site

This bolt remained partially within the rod end bearing inner race, which was also cocked, exposing a portion of the bearing's rolling elements. The bolt head-side bushing and three washers were present between the bolt head and rod end. The nut, nut-side bushing, nut-side washers, and cotter pin were not present. A search of the main transmission deck found a loose bushing within the right-side longitudinal beam. The bolt between the fore/aft servo input link and the fore/aft servo input clevises was removed and it exhibited no evidence of fractures or visible deformation of the bolt shank.

According to maintenance records, from December 17-29, 2021, multiple maintenance actions were performed. The director of maintenance and another mechanic traveled from the operator's base in Oregon to PMRF Barking Sands and worked with two additional mechanics, based in PMRF Barking Sands, to complete these maintenance actions. The fore/aft primary servo of the flight control system was installed on December 28, 2021. About 7.5 flight hours had elapsed from the time the fore/aft primary servo was installed until the day of the accident. According to both the director of maintenance and a mechanic who traveled to PMRF, when the main gearbox assembly is removed from the helicopter, the primary servos typically remained installed on the main gearbox housing. Furthermore, the primary servos were typically disconnected from the flight control system at each servo input link's clevis

connection to the main gearbox bellcranks. During a primary servo replacement, the servo input link would be removed from the old primary servo and transferred to the new primary servo. The condition of the removed hardware, such as bolts and washers would be checked and replaced as needed. One-time-use hardware such as cotter pins and nuts with nylon locking features would be discarded after each removal. After all the work on a work order was complete, a company certified inspector inspected all work performed.

Pilot Information

Certificate:	Airline transport	**Age:**	64,Male
Airplane Rating(s):	None	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 2, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 7, 2021
Flight Time:	16515 hours (Total, all aircraft)		

Pilot Information

Certificate:	Airline transport	**Age:**	55,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	February 12, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 8, 2021
Flight Time:	7060 hours (Total, all aircraft), 2682 hours (Total, this make and model)		

Cabin crew Information

Certificate:	None	**Age:**	43,Male
Airplane Rating(s):	None	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Cabin crew Information

Certificate:	None	**Age:**	42,Female
Airplane Rating(s):	None	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Sikorsky	**Registration:**	N615CK
Model/Series:	S-61N	**Aircraft Category:**	Helicopter
Year of Manufacture:	1962	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	61814
Landing Gear Type:	None; Other launch/recovery system	**Seats:**	11
Date/Type of Last Inspection:	February 9, 2022 AAIP	**Certified Max Gross Wt.:**	21000 lbs
Time Since Last Inspection:	7 Hrs	**Engines:**	2 Turbo shaft
Airframe Total Time:	36745 Hrs as of last inspection	**Engine Manufacturer:**	GE
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	CT58-140-2
Registered Owner:	CROMAN CORP	**Rated Power:**	1500 Horsepower
Operator:	CROMAN CORP	**Operating Certificate(s) Held:**	Rotorcraft external load (133), On-demand air taxi (135), Agricultural aircraft (137)
Operator Does Business As:		**Operator Designator Code:**	JYEA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PHBK,12 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	10:51 Local	**Direction from Accident Site:**	13°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	26°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Kekaha, HI	**Type of Flight Plan Filed:**	Company VFR
Destination:	Kekaha, HI	**Type of Clearance:**	VFR
Departure Time:		**Type of Airspace:**	Class D

Airport Information

Airport:	Barking Sands Navy Base BKH	**Runway Surface Type:**	Asphalt
Airport Elevation:	18 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	PHBK	**IFR Approach:**	None
Runway Length/Width:	6002 ft / 150 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	4 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	22.040149,-159.78055

Administrative Information

Investigator In Charge (IIC):	Ward, Mark
Additional Participating Persons:	William Tu (Shawn); FAA; HI Brain Beattie; Croman Corp. Javier Casanova; Sikorsky Aircraft David Gridley; GE engines
Original Publish Date:	July 26, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=104681