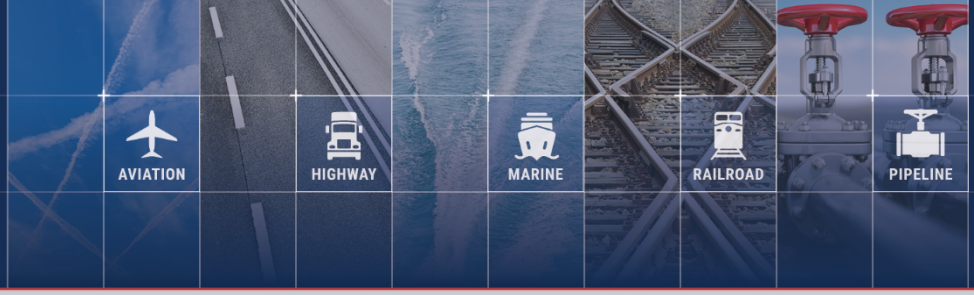

Aviation Investigation Final Report

Location:	North Fork, Idaho	**Accident Number:**	CEN22FA331
Date & Time:	July 21, 2022, 16:42 Local	**Registration:**	N388RA
Aircraft:	Columbia Helicopters CH-47D	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Public aircraft		

Analysis

The public firefighting helicopter was equipped with a 2,600-gallon water bucket attached via a 200-ft long line and a belly cargo hook. On the day of the accident, the pilots had flown about 1.5 flight hours and dropped multiple bucket loads. A witness video of the accident revealed that the helicopter was setting up to dip the water bucket in the river when it ascended and subsequently began a left yaw. Once it had turned about 180° the helicopter suddenly pitched nose down. The left yaw rate increased as the helicopter rapidly descended until it impacted the river.

Postaccident examination of the wreckage revealed no evidence of malfunction or failure of the helicopter's rotor systems, transmission and drive system, structures, and engines. The witness video corroborated that there was no structural failure before ground impact. Examination of the hydraulic system found no evidence of contamination, loss of fluid, or malfunction that would contribute to a loss of control inflight. Examination of the flight control system linkages showed no evidence of preimpact disconnection or separation. None of the hydraulic actuators of the flight control system exhibited functional hydraulic anomalies. The lee plugs that were found to be missing from the aft swiveling upper boost actuators (UBA) likely blew out from the actuator due to ground impact forces. The yaw integrated lower control actuator's (ILCA) control rod and lever likely over-traveled upward due to ground impact, resulting in its impact with the yaw ILCA's main control valve spool. While the jam indicators of multiple hydraulic actuators were extended, their extension was likely due to ground impact forces on the actuators rather than an actual jam of the control valves of multiple actuators during the accident flight. Therefore, no malfunction of the hydraulic system and flight control system was found.

Analysis of the witness video showed no rotor speed anomalies throughout the accident flight. The video also showed the helicopter initially in a coordinated left yaw about the vertical axis

as it remained in a mostly level attitude through the 180° turn. Because each UBA's input is a result of the mixed pitch, roll, yaw, and thrust outputs, more erratic helicopter attitudes would have been expected with anomalous behavior of the UBAs. Therefore, malfunction of the UBAs was unlikely in this accident.

A simulation study showed that the flight control inputs needed for the accident flight profile were not beyond the capability of a normally functioning flight control system. Additionally, the left pedal input was not at its forward limit stop until about 2 to 3 seconds after completion of the 180° left turn; therefore, it was likely that the initial 180° left turn was intentionally commanded by the pilot flying. Accordingly, investigators explored factors that could result in the flight crew's inability to arrest the left yaw with the absence of a flight control system malfunction or failure.

An iPad used by the flight crew was discovered in the river near the wreckage. The iPad displayed three distinct gouges on its long side and a bend from the back side. Testing with an exemplar helicopter and the iPad showed that it was possible to wedge the iPad between the airframe and the copilot's pedals in a manner that would produce three distinct gouges corresponding to parts of the airframe and the copilot's pedal heel slide. Additionally, as force was applied to the right pedal to bring the pedals to neutral, the jammed iPad would press against the copilot's left pedal adjustment lever, which could result in unintended readjustment of the copilot's left pedal position, and the iPad would remain jammed. In the wreckage, the copilot's left pedal was found in the forward-most adjustment position, which was unusual given his height. Testing also found that, when the left pedal was pushed forward, the iPad became unjammed but could migrate further down between the left pedal and the airframe while still preventing the left pedal's return back to its neutral position. Lastly, the position of the yaw magnetic brake clevis connection was found in a position consistent with the left pedal (in the cockpit controls) being forward of neutral.

Based on the aggregate findings, it is likely that during the 180° left turn, the unsecured iPad migrated into the copilot's left pedal and became jammed between his left pedal and the airframe, restricting the pedals from moving back to neutral. Testing showed that it would be difficult for the copilot to reach down to move the iPad, and possible for the copilot to bump the cyclic control forward when attempting to reach down, which would result in a sudden nose-down pitch, as seen in the accident video. The helicopter descent continued, likely due to a commanded reduction in the thrust lever. The reduction of thrust from both rotor systems would alleviate the increasing yaw rate as the left pedal could not be returned to neutral. The pilot likely pushed the left pedal further forward to assist the copilot in removing the jammed iPad, but the iPad likely migrated further down between the left pedal and the airframe, putting it further out of reach from the copilot while significantly increasing the helicopter's left yaw rate.

The operator stated that the flight crew's use of the iPad was not required during the firefighting flight and that the copilot should have been monitoring the cargo hook load gauge during water pickups. However, it is plausible that the copilot was using the iPad before the water pickup and was holding onto it, allowing for its migration into the pedals during the

accident flight. While the operator had a portable electronic device (PED) policy that prohibited the use of cell phones during an operation, it was ambiguous as to whether that policy extended to use of company-issued iPads. Regardless, the security of all items in the cockpit during an operation is necessary to ensure they do not adversely interact with critical systems, such as flight controls.

Probable Cause and Findings

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

The failure of the flight crew to properly secure a company-issued iPad, leading to its migration into and jamming of the copilot's left pedal, preventing the pilot from arresting a left yaw, and resulting in a loss of control.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	(general) - Not attained/maintained
Environmental issues	Access to equipment/controls - Effect on operation
Environmental issues	Controls and displays - Ability to respond/compensate

Factual Information

History of Flight

Maneuvering	Loss of control in flight (Defining event)
Other	Loss of control in flight

On July 21, 2022, about 1642 mountain daylight time, a Columbia Helicopters CH-47D, N388RA, was destroyed when it was involved in an accident near North Fork, Idaho. The pilot and copilot were fatally injured. The helicopter was operated as a public aircraft.

The helicopter operator was contracted by the United States Forest Service (USFS) for firefighting operations related to the Moose fire. The helicopter was relocated to the area two days before the accident and began firefighting flights the day before the accident. The helicopter was equipped with a 2,600-gallon water bucket attached to the helicopter's belly-mounted cargo hook via a 200-ft long line. On the day of the accident, the pilots had flown about 1.5 flight hours and dropped multiple bucket loads.

A 38-second video of the accident flight recorded by a local resident showed the helicopter setting up to dip the water bucket into the Salmon River. At the start of the video, the helicopter was hovering about 200 ft above ground level (agl) over the river with its empty water bucket, at the end of the long line, swinging close to the surface of the river. (See figure 1.) The helicopter then climbed to about 325 ft agl over a period of 8 to 9 seconds; its heading remained generally the same throughout the ascent. Next, the helicopter began to yaw to the left, and once it had turned about 180°, the helicopter suddenly pitched down, continued to yaw left, and descended. The left yaw continued through the descent until the helicopter impacted the river and riverbank.

Figure 1. This still image from the accident video shows the helicopter hovering above the river with the empty orange water bucket just above the water (source: witness video).

The pilots were rescued by nearby USFS firefighters who witnessed the accident and were transported to nearby hospitals, where they later succumbed to their injuries.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	41,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	August 18, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 27, 2022
Flight Time:	5120 hours (Total, all aircraft), 4015 hours (Total, this make and model), 4820 hours (Pilot In Command, all aircraft), 31 hours (Last 90 days, all aircraft), 21 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	36,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	December 1, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 25, 2021
Flight Time:	1727 hours (Total, all aircraft), 6.8 hours (Total, this make and model), 19 hours (Last 90 days, all aircraft), 17 hours (Last 30 days, all aircraft)		

According to the pilot's USFS interagency helicopter pilot evaluation application, the interagency guidelines for vertical reference (VTR)/external load training required that the pilot demonstrate VTR knowledge and proficiency with a 150-ft long line. The pilot's USFS VTR demonstration and proficiency check were completed June 27, 2022, during which a 200-ft long line was used. The pilot reported on the application that he had accumulated 38 hours of vertical reference flight experience, 18 of which were in a Boeing BV234 (the civilian variant of the CH-47D). A Federal Aviation Administration (FAA) letter of competency showed that the pilot satisfactorily met the requirements of 14 *Code of Federal Regulations (CFR)* Part 133.37 and was approved to conduct Class A, B, and C external loads in a CH-47D helicopter. Additionally, the pilot demonstrated proficiency in system and flight operations in 14 *CFR* Part 137 firefighting operations in the CH-47D.

On February 27, 2022, the copilot completed initial training for second-in-command (SIC) duties in the CH-47D, which was conducted by Columbia Helicopters. He had accumulated 6.6 hours as pilot-in-command (PIC) in the CH-47D during training and while repositioning the helicopter to various locations. The day before the accident, he had accumulated 3.5 hours as SIC, and on the day of the accident, he had accumulated about 1.5 hours as SIC, all involving firefighting flights related to the Moose fire. On the copilot's most recent satisfactory proficiency check, he received company ground training, which included Part 133 and 137 operations and long line proficiency.

Aircraft and Owner/Operator Information

Aircraft Make:	Columbia Helicopters	**Registration:**	N388RA
Model/Series:	CH-47D	**Aircraft Category:**	Helicopter
Year of Manufacture:	1989	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	88-0097
Landing Gear Type:	Ski/wheel	**Seats:**	4
Date/Type of Last Inspection:	Continuous airworthiness	**Certified Max Gross Wt.:**	50000 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo shaft
Airframe Total Time:	7735.9 Hrs at time of accident	**Engine Manufacturer:**	Honeywell
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	T55-GA-714A
Registered Owner:	AKCH1 LLC	**Rated Power:**	4777 Horsepower
Operator:	ROTAK, LLC	**Operating Certificate(s) Held:**	Rotorcraft external load (133), On-demand air taxi (135), Agricultural aircraft (137), Certificate of authorization or waiver (COA)
Operator Does Business As:	ROTAK Helicopter Services	**Operator Designator Code:**	

Originally manufactured by Boeing for the United States Army, the Columbia Helicopters CH-47D is a surplus military helicopter that was type certificated under the restricted category. The CH-47D has two fully articulated, three-bladed rotor systems, in a tandem (forward and aft) configuration that provides helicopter lift, thrust, and attitude control.

Review of the accident helicopter's maintenance records revealed that, as of July 20, 2022, the helicopter accumulated an aircraft total time of 7,735.9 hours and Hobbs time of 69.5 hours.

The records showed that there were no unresolved maintenance discrepancies at the time of the accident and no anomalous trends.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	INDIANOLA,3528 ft msl	**Distance from Accident Site:**	0.1 Nautical Miles
Observation Time:	17:04 Local	**Direction from Accident Site:**	70°
Lowest Cloud Condition:	Clear	**Visibility**	6 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots / 19 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	238°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.99 inches Hg	**Temperature/Dew Point:**	37.2°C / -0.6°C
Precipitation and Obscuration:	In the vicinity - None - Smoke		
Departure Point:	Salmon, ID (KSMN)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Salmon, ID (KSMN)	**Type of Clearance:**	VFR
Departure Time:		**Type of Airspace:**	Class G;Restricted area

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	45.399833,-114.16656

The helicopter came to rest mostly upright in the Salmon River except for the aft fuselage and aft pylon. The aft pylon partially separated from the aft fuselage and came to rest on its right side and was partially submerged in the water. Both engines remained installed on the airframe. The lower portion of the airframe exhibited significant upward deformation and crushing due to ground impact. The cockpit floor and the ramp were submerged in the water while the cabin floor was deformed significantly upward. The two cockpit doors were separated from the airframe. The forward rotor blades remained attached to the forward rotor head, but exhibited fragmentation on their outboard ends due to impact. The aft rotor blades

remained attached to the aft rotor head but exhibited fragmentation on their outboard ends due to impact.

The pilot (left seat) and copilot (right seat) cyclic controls remained attached and connected to their mounts. The copilot's cyclic control was partially fractured at its base. Manual movement of the pilot's cyclic control resulted in a corresponding movement of the copilot's cyclic control in both lateral and longitudinal axes. Manual movement of the pilot's cyclic control resulted in movement of the longitudinal control tubes that route to the transfer bellcranks, but the longitudinal control tubes were fractured near their aft end. However, the aft end of the longitudinal control tubes remained connected to the transfer bellcranks via their rod ends. Both the pilot's and copilot's cyclic control grips remained installed on their respective cyclic controls. Both thrust levers were present in the cockpit structure. The pilot's thrust lever remained connected to its bellcranks; the bellcrank was impact separated from the airframe. The pilot's thrust lever grip was whole, but its buttons were damaged during recovery of the wreckage. Manual movement of the pilot's thrust lever resulted in a corresponding movement of the copilot's thrust lever as well as movement of the longitudinal control rod going to the transfer bellcranks; however, the longitudinal control rod was fractured near its forward end as well as near its aft end, and the central portion of the longitudinal control rod was not present. The copilot's thrust lever grip and switches were crushed downward. Note: in this report "control rod" and "control tube" are synonymous with "connecting link," which is the terminology used in the CH-47D maintenance manual.

The pilot's pedal set was present, but both pedals were disconnected from their respective pedal position adjustment plates; therefore, movement of the left and right pedals did not result in a corresponding movement of both pedal jackshafts. All pedal position adjustment plate stops were present on the pilot pedal set. The right pedal position lever had moved beyond its limit and was pointed left. The left pedal position lever had no anomalous damage. Both pedal return springs remained installed. Both left and right brake levers remained installed, and all brake lines remained attached. Movement of the pilot's pedal position adjustment plates resulted in a corresponding movement of the copilot's pedal set as well as the longitudinal control rod leading to the transfer bellcranks. The lateral interconnect control rod between the pilot's and copilot's pedals remained connected, but was deformed upward about mid-length.

The copilot's pedal set was present, and both pedals remained connected to their respective position adjustment plates. The left pedal was in the forward-most "5" adjustment position and the right pedal was in the middle "3" adjustment position. The left pedal position lever was intact. The right pedal position lever was fractured near its base. The operator stated that the right pedal in the middle adjustment position was typical for that pilot; however, the position of the left pedal was unusual given the copilot's height. Both left and right brake levers remained installed, and all brake lines remained attached. The right pedal shaft support attaching to the

airframe had separated from the airframe but remained attached to the right pedal jackshaft, with all rivet heads present on the support. The left pedal control rod, connecting to the left side of the left pedal jackshaft, had separated from its control tube, the latter of which remained installed.

The yaw control rod was continuous from the left side bellcrank to its transfer bellcrank below the ILCAs. The thrust control rod was fractured in overload and the mid-section of the rod was not present, but the two rod ends remained connected between the cockpit bellcrank and the thrust transfer bellcrank. All four transfer bellcranks moved freely and were not seized. On the yaw/thrust pallet, the yaw magnetic brake, yaw viscous damper, and yaw centering control spring remained installed. Manual movement of the yaw centering spring revealed no evidence of restriction in both directions of travel. The yaw magnetic brake's clevis was in the up position, consistent with a cockpit left pedal forward position.

The pitch, roll, yaw, and thrust ILCAs remained installed in their normal locations within the flight control closet. The crank for the input rod lever had fractured on the pitch ILCA, but the crank remained retained within the lever. The input rod levers remained intact on the remaining three ILCAs. All hydraulic lines remained connected to the ILCA manifold. The yaw ILCA's No. 2 jam indicator had extended. The thrust ILCA's No. 1 jam indicator had extended. All other ILCA jam indicators were not extended. The connecting rods and levers between the output of all four ILCAs to the first stage mixing unit were continuous and intact.

The two mixing units remained installed on the airframe. All linkages from the first stage mixing unit to the second stage mixing unit remained connected and intact except for the left yaw/right roll control rod, which had fractured at its forward end, behind the rod end threads. The forward rod end of the left yaw/right roll control rod remained connected to the first stage mixing unit while the remainder of the control rod remained connected to the aft rotor control bellcrank via its aft rod end. The left yaw/right roll control rod fracture exhibited signatures of overload and did not exhibit evidence of corrosion on the fracture surfaces or the visible threads.

All control linkages from the second stage mixing unit to the forward UBAs remained connected and intact. The two aft rotor control rods remained connected and intact from its forward-most attachment points to the aft fuselage idler bellcranks. All idlers and walking beams within the tunnel (on the top of the airframe between the two rotor pylons) remained installed and intact. The aft fuselage lateral bellcrank, leading to the aft swiveling UBA, was fractured in overload, but the control rod ends remained connected on both sides of the bellcrank. All other aft rotor controls remained connected from the aft fuselage bellcranks to both aft UBAs. Both the forward and aft UBAs remained connected to their respective swashplates. The forward longitudinal cyclic trim (LCT) actuator remained installed between the forward swashplate and its bellcrank and exhibited no anomalous damage. The aft LCT

actuator remained connected to both the aft swashplate and its yoke. The lower portion of the aft LCT actuator housing had fractured, but the fixed link remained installed.

Examination of the three hydraulic systems found no evidence of contamination, loss of fluid, or malfunction.

Flight recorders

The helicopter was not equipped with a cockpit voice recorder, flight data recorder, or a cockpit image recorder, nor was it required to be.

Medical and Pathological Information

An autopsy of the pilot was performed by the Ada County Coroner's Office, as authorized by the Lemhi County Coroner. According to the autopsy report, the pilot's cause of death was multiple blunt force injuries. The autopsy did not identify any significant natural disease.

The FAA Forensic Sciences Laboratory also performed toxicological testing of postmortem specimens from the pilot. No tested-for substances were detected. At the request of the Coroner's Office, NMS Labs performed toxicological testing of postmortem femoral blood from the pilot, which detected caffeine.

An autopsy of the copilot was performed by the State of Montana Department of Justice Forensic Science Division. According to the autopsy report, the copilot's cause of death was multiple blunt force injuries, and his manner of death was accident. The autopsy did not identify significant natural disease.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens from the copilot. According to the FAA toxicology report, the dissociative anesthetic medication ketamine was detected in the copilot's femoral blood and urine, and the ketamine metabolite, norketamine, was detected in his femoral blood. Postaccident treatment records documented that the copilot had been given ketamine as part of his medical care after

the accident, before arriving at the hospital. The copilot's postmortem toxicological testing was otherwise negative for tested-for substances.

Tests and Research

During recovery of the accident helicopter, the flight crew's tablet computer, an Apple iPad, was found in the river near the cockpit. There were three distinct gouge marks on the one of the long sides of the iPad and its case. The iPad exhibited a bend from the back of the case toward the screen. The top two gouges extended from the edge of the case inward into the screen about 3 in. The bottom gouge was shallower and did not extend into the screen.

In order to determine the origin of the damage to the iPad, the operator provided access to an exemplar CH-47D helicopter whose cockpit was configured similarly to the accident helicopter. The following items were completed to configure the exemplar helicopter to most accurately represent the accident helicopter conditions at the time of the accident:

• Power transfer units 1 and 2 turned on to supply hydraulic assisted power.

• Trim release was turned on via the switch on the center console, which unlocked the yaw magnetic brake, resulting in the pedals staying in position once foot pressure was relieved from the pedal.

• On the pilot controls, left pedal was pushed forward, which resulted in corresponding movement of the copilot's left pedal.

• An iPad was placed between left pedal and airframe, next to the heel slide support assembly on the copilot's side.

Once the iPad was placed in the copilot's left pedal area, the pilot's pedals were slowly manipulated to determine how the position of the iPad would change. Additional pressure was applied to the pilot's left pedal, which allowed the iPad to fall farther into the left pedal and jam between the heel slide support assembly. The jammed iPad prevented the pedals from recentering. The iPad also pushed against the copilot's left pedal adjustment lever. When pressure was applied to the pilot's right pedal, the iPad was squeezed between the pedal and the heel slide support assembly, which was concentrated near the gouges. The gouges in the iPad aligned with a sharp, vertical metal piece of the heel slide support assembly underneath the heel slide. Additional right pedal input forced the iPad to apply more pressure to the copilot's pedal adjustment lever.

With the seat restraints on and seats adjusted for comfort, neither a 5-ft, 7-in-tall male and 6-ft, 2-in-tall male could reach the iPad in this position. The accident copilot's height was 5 ft, 10 in. Additionally, wearing a flight helmet would limit the ability to reach down, as the flight helmet would contact the instrument panel visor.

NTSB Video Study

The objective of this video study was to estimate the helicopter rotor speed (Nr), the yaw, pitch and roll angles of the helicopter, the yaw rate of the helicopter, and the helicopter's altitude above ground level. Based on a visual-information-based and sound spectrum analysis, the study determined that the rotors were rotating near 100% Nr, about 225 rpm until the helicopter impacted the water. The helicopter's counterclockwise yaw rate was about 38° per second at the start of the left turn, about 50° per second at the end of the initial 180° turn (about 5 seconds after the start of the left turn) and increased to about 148°/second when it impacted water (about 8 seconds after completion of the initial 180° turn).

Boeing Simulation Study

Based on the helicopter attitude and altitude estimations from the NTSB video study, the NTSB requested that Boeing conduct a study using a CH-47 simulation to estimate the cockpit flight control inputs that would best match the video study results. To simplify this approach, the simulation only modeled the helicopter motions and did not include the effects of the long line and water bucket. The Airworthiness Group Factual Report in the docket for this investigation contains the details of this simulation study.

Assumptions made for the simulation included no failure modes of the flight control system, both automatic flight control system (AFCS) computers activated and functioning normally, the trim release remaining deactivated throughout the simulation, and cockpit controls trimmed perfectly to the positions required for the initial hover as well as centered extensible link actuator commands. The simulation's helicopter motions generally matched that of the estimated helicopter motions from the NTSB video study. The simulation's estimated cockpit flight control positions showed that none of the controls exceeded their position limits to fly the accident flight profile. Additionally, a left pedal input of about 50% (halfway between neutral and its forward stop) was needed to complete the initial 180° left turn, and the left pedal was at its forward stop to achieve the yaw angles for the remainder of the accident flight.

Component Testing

The yaw ILCA input rod stop for actuator extension was fractured due to impact with its control rod and lever. The control rod and lever were jammed onto this extension stop, so the lever was removed. The actuator was subsequently installed on a test bench and the output piston was manually actuated. The piston friction was measured to be within acceptable limits. An acceptance test procedure of the stability augmentation system side of the yaw

ILCA was performed. The No. 1 system jam indicator, which was not extended at the accident site, extended during this test. The No. 2 system jam indicator, which was extended at the wreckage examination at the accident site, functioned normally.

The pressure-side lee plugs on the aft swiveling UBA were not present on scene. Postaccident functional testing of the UBA revealed that the lee plug bores met the drawing requirement. Replacement lee plugs were installed, and the acceptance test procedure was completed; generally, the actuator exhibited smooth actuation with no evidence of binding, juddering, or other anomalous movement or noises.

Additional Information

The operator's company operations manual, with revision 10 in effect at the time of the accident, contained policy pertaining to portable electronic devices (PED). The policy stated:

The use of mobile phones and PED for company personnel is strictly prohibited during critical phases of flight, ground operations, maintenance, and vehicle operations. Exceptions to this can be made for emergencies that require immediate communication and when utilization of the device is critical to the task being performed.

On July 19, 2023, as a result of the investigation, the US Forest Service issued interagency safety alert IASA 23-01, Portable Electronic Device (PED) Safety and Security. This safety alert provides information to operators regarding the security of PEDs to reduce the risk of accidental drops and to prevent them from creating a hazard during flight, and best practices of securing such devices.

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Bryan Fisher; Federal Aviation Administration; Boise, ID Ely Woods; ROTAK; Anchorage, AK Rob Roedts; Columbia Helicopters; Aurora, OR Jeffrey Hutchinson; Boeing; Philadelphia, PA Jennifer McDuffie; Honeywell; Phoenix, AZ John Waddell; US Forest Service; Boise, ID Rob Van Horn; US Forest Service Ian Hansen; Federal Aviation Administration; Boise, ID
Original Publish Date:	June 26, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105544