Aviation Investigation Final Report

Location:	Oxnard, California	**Accident Number:**	LAX05LA020
Date & Time:	November 9, 2004, 12:15 Local	**Registration:**	N655TV
Aircraft:	American Eurocopter AS350-BA	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

During a practice autorotation, the collective down lock engaged, which resulted in an uncontrolled descent and collision with terrain. The pilot and an instructor pilot were conducting the first practice autorotation of a planned series, and the pilot entered the autorotation about 500 feet above ground level. After lowering the collective the pilot kept the collective in the down position until he was in the flare. When the pilot tried to pull up on the collective, it would not move and both pilots saw that the collective down lock had engaged. Both pilots attempted to unlatch the collective, but they were unsuccessful. With the collective locked at flat pitch, the helicopter impacted the ground hard in a level attitude with some forward speed and it rolled over. Post accident investigation revealed the helicopter was equipped with an aftermarket avionics control panel. The collective lever lock is installed on this control panel console; it is a spring steel plate with a hole in it to capture the collective locking tab. The lock also has a rubber grommet below the locking hole to dampen any vibration. With the collective in the full down position, the aftermarket console has about a 1/16-inch clearance between the lock plate and the collective lock tab, while the Eurocopter stock console panel has a 1/2-inch clearance. Exemplar aircraft with both the stock and aftermarket consoles were examined. In some of the aircraft, the grommet was not touching the console. This condition would allow the locking lever to vibrate and also decrease the clearance between the locking plate and the locking tab. This accident is the second known accident where the collective lock has inadvertently engaged in-flight with this particular aftermarket avionics panel installed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The inadvertent in-flight engagement of the collective down lock, which resulted in an

uncontrolled descent and ground impact. The collective down lock engagement was likely due to a combination of the reduced clearance between the lock plate and the collective with this avionics panel design, the collective down lock alignment/adjustment, and the tendency of the flexible lock plate to vibrate with the natural harmonic rhythmus of the helicopter.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: DESCENT

Findings
1. (C) ROTORCRAFT FLIGHT CONTROL,COLLECTIVE CONTROL - LOCKED
2. (C) CONTROL FRICTION - INADVERTENT ACTIVATION - PILOT IN COMMAND(CFI)
3. (C) ACFT/EQUIP,INADEQUATE CONTROL LOCATION - OTHER INSTITUTION

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
4. (C) REMEDIAL ACTION - NOT POSSIBLE - PILOT IN COMMAND(CFI)

Factual Information

HISTORY OF FLIGHT

On November 9, 2004, about 1215 Pacific standard time, an American Eurocopter AS350-BA, N655TV, was executing an autorotation when the collective flight control became locked, and the helicopter made a hard landing at Oxnard Airport, Oxnard, California. Coastal Helicopters LLC was operating the helicopter under the provisions of 14 CFR Part 91. The certified flight instructor (CFI) pilot and the commercial pilot undergoing instruction (PUI) sustained minor injuries; the helicopter sustained substantial damage. The instructional local flight departed Camarillo, California, at about 1100. Visual meteorological conditions prevailed, and no flight plan had been filed. The primary wreckage was located at 34 degrees 11.982 minutes north latitude and 119 degrees 13.109 minutes west longitude.

The purpose of the instructional flight was recurrent factory pilot training for the PUI. The CFI was a factory pilot, employed by American Eurocopter Corporation (AEC), located in Grand Prairie, Texas.

The National Transportation Safety Board investigator-in-charge (IIC) interviewed the CFI and the PUI. Both pilots stated that while performing an intended power recovery autorotation, the collective locking mechanism inadvertently engaged, preventing the PUI from applying any pitch to the main rotor system by use of the collective lever. Both pilots attempted to unlock the collective but were unsuccessful before the helicopter impacted the ground. After the accident sequence, the helicopter came to rest on its right side.

Investigators from the Safety Board, the Federal Aviation Administration (FAA), American Eurocopter, and Turbomeca USA examined the wreckage at Oxnard Airport on November 11, 2004. During the wreckage examination, no abnormalities were found with the engine, flight controls, or rotor system. One area of concern during this investigation was with the collective locking mechanism.

The helicopter was equipped with an aftermarket avionics console. The console, model P132, was manufactured by Geneva Aviation, Inc. Aircraft records indicated it had been installed on November 11, 2002, in accordance with instructions provided in the supplemental type certificate (STC) number SH4747NM.

The larger Geneva P132 Avionics Switch Console replaces the stock AEC console and replaces the stock auto type fuses with Mil-spec circuit breakers. The console also allows for the installation of additional avionics.

The footprint dimensions of the Geneva console are approximately the same as the stock

panel. The front height of the Geneva console is approximately 13 inches. The front height of the stock console is approximately 11 inches.

The accident helicopter's console was damaged during the accident sequence. Measurements of the clearance between the collective engagement stud and the locking plate were inconclusive due to the impact damage to the console.

Upon examination, the accident helicopter's console appeared to be installed in accordance with the installation instructions for the STC.

Exemplar aircraft with the stock console and the Geneva console were examined, measured, and photographed.

The collective lever lock is installed on the console; it is a spring steel plate with a hole in it to capture the collective locking tab. The lock also has a rubber grommet below the locking hole to dampen any vibration. The stock AEC console with the collective in the full down position has about a 1/2-inch clearance between the collective lever lock and the collective locking tab. The Geneva console with the collective in the full down position has about a 1/16-inch clearance.

During the exemplar aircraft examinations, both the ones equipped with the stock and ones equipped with the Geneva console, in some of the aircraft, the grommet was not touching the console. This condition would allow the locking lever to vibrate and also decrease the clearance between the locking plate and the locking tab.

On July 1, 2004, a similar accident (NTSB accident LAX04LA254) occurred in Scottsdale, Arizona. This involved a Eurocopter AS350 B2. In this accident, the flight crew was performing a maintenance check flight after a major overhaul that included the installation of a Geneva console. The flight crew reported the collective locking mechanism inadvertently engaged. A post impact fire consumed the aircraft. This accident is currently under investigation, and no final report has been filed.

On December 2, 2004, the FAA issued a Special Airworthiness Information Bulletin (SAIB) alerting all owners and operators of all Eurocopter France AS-350 and AS-355 rotorcraft that have aftermarket center console panels installed, that preliminary investigations reveal a potentially hazardous situation in which the collective lock strip inadvertently engages during flight maneuvers, locking the collective in the down position.

The SAIB made the following recommendations;

Inspect the condition of the collective locking strip, P/N 350A27-3107-26, to ensure the strip has a positive spring force to hold it away from the collective knob and firmly against the center console.

Inspect and ensure the rubber grommet, P/N 85007-130-015, is resting against the center console.

To ensure proper rigging of the collective, review AS-350 collective lock rigging procedures, Work Card 67.10.00.501 without autopilot, and Work Card 67.10.00.502 with autopilot.

Ensure that there is a positive clearance (nominally 7mm) between the collective lock knob, P/N 350A77-1309-24, and the collective strip.

Ensure the aftermarket installation is installed as to allow proper clearance for the collective lock at all times.

Ensure the collective lock spring mounting bolts are secure and torque properly, 35-44 in.

ADDITIONAL INFORMATION

The IIC released the wreckage to the owner's representative on November 12, 2004.

Information

Certificate:	Commercial; Flight instructor	**Age:**	38,Female
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:		**Last FAA Medical Exam:**	January 1, 2004
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 1, 2004
Flight Time:	2200 hours (Total, all aircraft), 395 hours (Total, this make and model), 2122 hours (Pilot In Command, all aircraft), 87 hours (Last 90 days, all aircraft), 36 hours (Last 30 days, all aircraft)		

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	50,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	April 1, 2004
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 1, 2002
Flight Time:	8895 hours (Total, all aircraft), 4383 hours (Total, this make and model), 8526 hours (Pilot In Command, all aircraft), 92 hours (Last 90 days, all aircraft), 39 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	American Eurocopter	**Registration:**	N655TV
Model/Series:	AS350-BA	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1590
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	August 1, 2004 100 hour	**Certified Max Gross Wt.:**	4630 lbs
Time Since Last Inspection:	44 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	3182.4 Hrs at time of accident	**Engine Manufacturer:**	Turbomeca
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	Arriel 1B
Registered Owner:	Coastal Helicopters LLC	**Rated Power:**	641 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	OXR	**Distance from Accident Site:**	
Observation Time:	11:50 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 4700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	18°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	CAMARILLO, CA (CMA)	**Type of Flight Plan Filed:**	None
Destination:	OXNARD, CA (OXR)	**Type of Clearance:**	VFR
Departure Time:	11:00 Local	**Type of Airspace:**	

Airport Information

Airport:	OXNARD OXR	**Runway Surface Type:**	
Airport Elevation:	43 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Simulated forced landing

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	34.199722,-119.218612

Administrative Information

Investigator In Charge (IIC):	Jones, Patrick
Additional Participating Persons:	Jerry Dees; Federal Aviation Administration; Van Nuys, CA Joseph Syslo; American Eurocopter Company LLC; Grand Prairie, TX Archie Whitten; Turbomeca USA; Grand Prairie, TX
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Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=60475