Aviation Investigation Final Report

Location:	Cabazon, California	**Accident Number:**	WPR23FA302
Date & Time:	August 6, 2023, 18:44 Local	**Registration:**	N555AS (A1); N4037S (A2)
Aircraft:	Bell 407 (A1); Sikorsky S-64E (A2)	**Aircraft Damage:**	Substantial (A1); Minor (A2)
Defining Event:	Midair collision	**Injuries:**	3 Fatal (A1); 2 None (A2)
Flight Conducted Under:	Public aircraft (A1); Public aircraft (A2)		

Analysis

Two helicopters collided in a Fire Traffic Area (FTA) during cruise flight while responding to a fire. Both helicopters were dispatched from Hemet-Ryan Airport (HMT), about 16 nm miles southwest of the fire. The first helicopter dispatched was a Bell 407, as an instructional Helicopter Coordinator platform, and the other was a Skycrane helitanker, dispatched to support water dropping operations.

The Bell 407 and Skycrane were dispatched and departed about 3 minutes apart. The Bell 407 travelled north, skirting and staying west of the San Jacinto Mountain range between HMT and the fire, while the Skycrane travelled northeast over the western section of the mountain range. Both helicopters were operating under FTA procedures overseen by the California Department of Forestry and Fire Protection (CAL FIRE). According to CAL FIRE's procedures, inbound aircraft were required to contact the Air Tactical Group Supervisor (ATGS) for permission to proceed into both the 12-nm Initial Communication Ring as well as the 7-nm No Communication (NOCOM) Ring of the FTA. Likely due to the mountainous terrain, neither helicopter was able to receive a clear radio signal from ATGS before entering the 12-nm ring. Instead, both helicopter crews decided to maneuver to have a better line of sight for radio transmission before reaching the 7-nm ring.

Flight track data and communication recordings showed that the Bell 407 flight crew initiated a 360° turn to establish communication with ATGS before crossing the 7-nm ring. Shortly after, they descended and leveled off at the maximum assigned altitude of 2,500 ft msl, about 5 nm from the fire, where they stayed in level flight until the collision.

The Skycrane's flight crew attempted to contact ATGS before entering the 7-nm ring; however, they continued about 1 nm, or 30 seconds, into the 7-nm ring before ATGS provided their clearance. After providing the Skycrane's call sign and the altimeter setting, ATGS stated, "you are cleared in 2,500 [ft] and below, air attack [ATGS] is at 4,500, one tanker at 3,500 [ft], and you have multiple hazards in the area. I [ATGS] will orient you once you get on the scene." The crew of the Skycrane, already in the FTA at about 4,000 ft msl, then acknowledged the clearance before climbing to about 4,300 ft, likely to avoid terrain. After both helicopters were cleared into the FTA and to the fire, no further position reports by either helicopter were recorded.

After climbing, the crew of the Skycrane then initiated a rapid descent after it overflew mountainous terrain to get to the maximum clearance altitude of 2,500 ft, which they reached 3 seconds before the collision; they were in a slight right descending turn during the impact about 2 nm west of the fire at 2,450 ft msl. According to NWCG guidelines, the Skycrane pilot should have advised ATGS that the aircraft could not comply with the altitude clearance and should have informed ATGS of their aggressive descent, which falls into the definition of a non-standard maneuver and constitutes communication to aerial supervision.

Surveillance footage showed that the Bell 407 was in level flight when it was impacted by the Skycrane's right wheel and tire assembly. The impact was immediately followed by an explosion and the separation of the Bell 407's tail boom, main rotor, mast, and transmission. The remaining portion of the fuselage continued in the direction of the Bell 407's flightpath until it impacted terrain. The Skycrane's right main wheel and tire assembly were damaged by the Bell 407's main rotor blade during the collision.

Postaccident examination of the Bell 407 revealed that all major structural components of the helicopter were present within the wreckage debris path. Wreckage and impact signatures were consistent with a midair collision. Postaccident examination of the engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation. All on-board communication and video recordings within the Bell 407 were destroyed by the post-crash fire.

CAL FIRE procedures stated that if any part of the clearance could not be complied with, "the inbound aircraft will remain outside the NOCOM ring until an amended clearance is received and understood." However, the Skycrane's crew did not remain outside of the 7-nm ring, did not report to ATGS that they were unable to comply with the altitude restriction, and did not inform ATGS of their intention to rapidly descend and follow mountainous terrain until they reached the clearance altitude.

Toxicology results indicated that the Bell pilot had used the antihistamine medication cetirizine. Although his cetirizine levels indicate a possibility that the Bell pilot may have been experiencing some associated impairing effects, the circumstances of the accident do not suggest that the pilot's impairment contributed to the accident.

Probable Cause and Findings

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

The Skycrane flight crew's decision to enter the Fire Traffic Area's 7-nm NOCOM ring at an altitude significantly above their maximum cleared altitude, which resulted in their need for an aggressive descent into congested airspace and subsequent failure to see and avoid the Bell 407.

Findings

Personnel issues (A1)	Decision making/judgment - Pilot of other aircraft
Personnel issues (A1)	Monitoring other aircraft - Pilot of other aircraft
Personnel issues (A2)	Monitoring other aircraft - Flight crew
Personnel issues (A2)	Decision making/judgment - Flight crew
Personnel issues (A2)	Incorrect action performance - Flight crew
Aircraft (A2)	Altitude - Not attained/maintained

Factual Information

History of Flight

Enroute (A1)	Midair collision (Defining event)
Enroute (A2)	Midair collision

On August 6, 2023, about 1844 Pacific daylight time, a Bell 407, N555AS, and a Sikorsky S-64, N4037S, collided mid-air near Cabazon, California. The Bell was destroyed and the pilot and two qualified non-crewmembers were fatally injured. The Sikorsky sustained minor damage and the pilot and copilot were not injured. Both helicopters were operated as public-use firefighting aircraft.

Before their respective flights, each flight crew was briefed on their mission. The Bell 407 was tasked as a Helicopter Coordinator (HLCO) training flight while the Sikorsky Skycrane was dispatched to support fire operations. The Skycrane received their dispatch instructions about 15 minutes before their departure.

Review of the communication recording from within the Skycrane shows that the recording started at 0:00 lapse time (refer to figure 1).

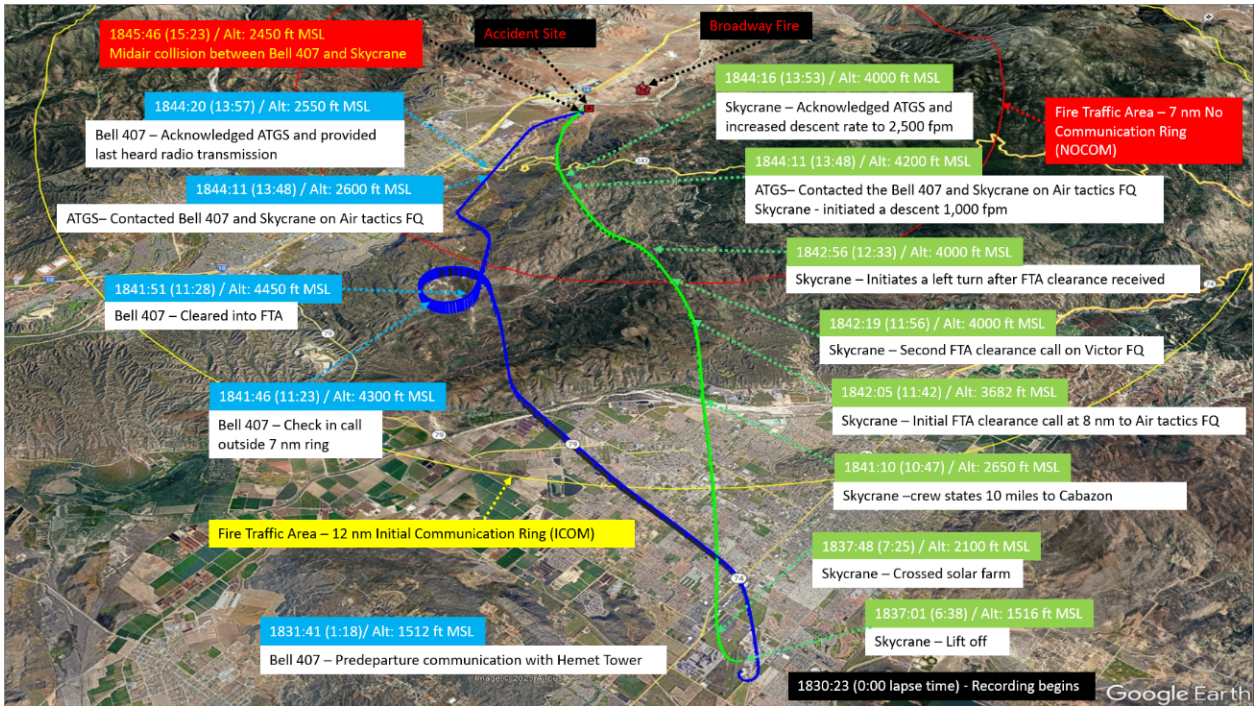


Figure 1. Recorded ADS-B data with select communications annotated.

At 01:18, the Bell 407 made a call to Hemet Base Victor Dispatch (Hemet Tower) requesting a bearing and distance to the fire. ADS-B data revealed that the Bell 407 departed from HMT about 1834 (02:37) and traveled north-northeast for about 2 nm then maneuvered to the north. HMT was about 3.5 miles from the edge of the FTA's 12-nm Initial Communication Ring.

The ADS-B flight track of the Bell 407 could not be correlated with the positioning of the Skyrcrane, which was based on CVR audio.

At 04:17, the Skycrane PIC initiated a 10-sec conversation with the SIC stating the Bell 407 was "going too" [to support the incident] and was either an HLCO or a training platform. The Skycrane crew continued their checklist; at 06:14, the crew simultaneously made separate radio calls and the PIC transmitted on the Hemet Common Traffic Advisory Frequency and the SIC contacted Hemet Tower of their impending departure. ADS-B data showed that the Skycrane departed HMT about 3 minutes after the Bell; the Skycrane maneuvered to the northeast and, at 07:25, crossed a solar farm about 0.5 nm northeast of HMT.

At 08:41, the Skycrane crew started an internal discussion that the first preferred call into the fire incident should be on the Air Tactics frequency. At 09:46, a broadcast from ATGS can be heard providing instructions for a tanker fire drop. At 10:47, in an internal conversation, the SIC told the PIC that they were about 10 nm from Cabazon. ADS-B data showed that the Skycrane was about 2,650 ft msl.

At 11:23, the Bell 407, while in a left circling maneuver, reported to ATGS that they were 8 miles west of the fire at 4,300 ft msl. At 11:28, ATGS provided an altimeter setting of 29.96 and cleared the Bell 407 into the FTA with a maximum altitude of 2,500 ft msl. ATGS also informed the Bell 407 that ATGS was at 4,500 ft, with one tanker at 3,500 ft, and that there were multiple hazards. ADS-B showed that the Bell 407 initiated a steep descent to meet the 2,500 ft maximum altitude restriction and leveled off to about 2,500 ft about 2 miles inside the 7 nm (NOCOM) ring.

At 11:42, the Skycrane PIC requested their clearance into the FTA on the ATGS frequency, stating, "Cabazon Air Attack, helitanker 37S checking in just inside 7 miles, err, uh, eight miles, rather." At 11:56, the SIC broadcasted on a Victor frequency, "Cabazon Air Attack helitanker 37S, 7 miles south inbound." At 12:08, the Skycrane SIC stated to the PIC that they tried to get their clearance from ATGS.

At 12:33, ATGS broadcasted the Skycrane's clearance into the FTA, stating, "and 37S altimeter 29.96, you are cleared in 2,500 [ft] and below, air attack [ATGS] is at 4,500, one tanker at 3,500 [ft], and you have multiple hazards in the area. I [ATGS] will orient you when you get on the scene." At 12:37, the Skycrane SIC points to the left, and the time on his watch read 18:34 local; the PIC initiated a left turn at 4,000 ft. ADS-B data showed that they were 6 nm from the fire incident and a mile into the FTA. At 12:45, the Skycrane acknowledged their clearance into the FTA. At 13:10, the Skycrane's altimeter needle is seen climbing through 4,150 ft. About 13:23, the altimeter read 4,200 ft and the heading was 020°. About 13:34, the altimeter read

4,300 ft with the same heading. At 13:41, the altimeter read 4,200 ft. At 13:48, ATGS contacted the Bell 407 and the Skycrane. At 13:49, the Skycrane initiated a descent at 1,000 fpm, through 4,100 ft. At 13:53, the Skycrane had a descent rate of 2,500 fpm and the altitude was crossing 4,000 ft. At 13:57, the Skycrane had a descent rate of 2,800 fpm and was crossing 3,900 ft. Also, at 13:53 and 13:57, respectively, the Skycrane and Bell 407 both acknowledged ATGS's request for their attention to receive further instruction. This is the last transmission recording heard from the Bell 407.

At 13:58, ATGS responded back to both helicopters and stated, "Ok, you have high tension power lines just south of the incident paralyzing…paralleling in front of the road and you got windmills off the east, those'll be your hazards." At 14:11, the Skycrane acknowledged ATGS and simultaneously descended at 3,000 fpm through 3,550 ft msl. At 14:22, the Skycrane continued its descent at 2,900 fpm through 3,350 ft. At 14:50, the Skycrane initiated a descending right turn at 2,000 fpm passing through 3,000 ft at 95 knots indicated. At 15:03, the Skycrane crew scanned the instrument gauges and configured the water tanks. At 15:06, the Skycrane continued its descent at 2,000 fpm, through 2,600 ft, at 100 knots. At 15:16, the Skycrane descended at 1,800 fpm through 2,550 ft at 100 knots. At 15:20, the Skycrane descended at 1,500 fpm through 2,500 ft at 100 knots. At 15:23, the Skycrane descended at 1,500 fpm through 2,450 ft at 100 knots. The recording showed that the right side collective control moved down, up, and then down again while the cyclic moved right and aft, before it swung back to a neutral position. Immediately after, the SIC asked, "oh …what was that?" At 15:25, the PIC asked if the Bell 407 struck the Skycrane, which the SIC confirmed. ADS-B data showed that Skycrane was on a descending right turn to the east while the Bell 407 was in level flight headed southeast. Both helicopters converged over descending terrain on the way to the fire. At 15:42, the Skycrane crew decided to initiate a precautionary landing onto a nearby field, where they landed without further incident. See figure 2.

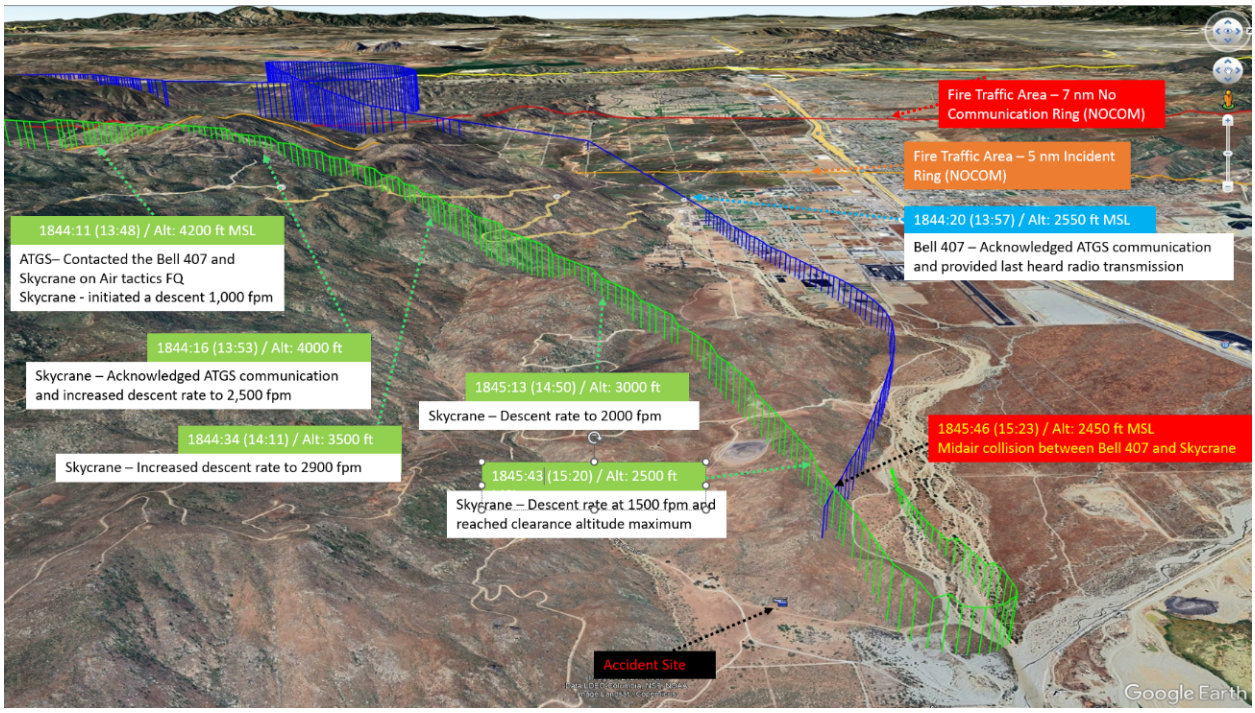


Figure 2. ADS-B data during later part of flight with select communications annotated.

Surveillance footage retrieved from a building-mounted camera about 1.5 nm miles from the accident showed that the Bell 407 was in a level flight attitude and that the Skycrane was in a descent when both helicopters collided. The tail boom, main rotor, mast, and gearbox separated after the impact. The remaining fuselage followed the Bell 407's flightpath until it hit terrain. The Skycrane landed without further incident.

Pilot Information (A1)

Certificate:	Commercial	**Age:**	55,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	February 16, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 27, 2023
Flight Time:	(Estimated) 2058 hours (Pilot In Command, all aircraft), 91 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

Co-pilot Information (A2)

Certificate:	Airline transport; Flight instructor	**Age:**	60,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 27, 2023
Flight Time:	(Estimated) 6988 hours (Total, all aircraft), 2000 hours (Total, this make and model), 6019 hours (Pilot In Command, all aircraft), 20 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Pilot Information (A2)

Certificate:	Commercial	**Age:**	59,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	August 1, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 27, 2023
Flight Time:	(Estimated) 8800 hours (Total, all aircraft), 287 hours (Total, this make and model), 8800 hours (Pilot In Command, all aircraft), 33 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Skycrane Pilot in command (PIC)

Siller Helicopters, Inc. hired the PIC in April, 2017. The pilot's last flight review was completed on April 27, 2023. His last proficiency check for currency under CAL FIRE contract rules (pilot carding) was completed on May, 3, 2023, by the United States Forest Service (USFS).

Skycrane Second in command (SIC)

Siller Helicopters, Inc. hired the SIC in June, 2023. The pilot's last flight review was completed on April 27, 2023. His last proficiency check for currency under CAL FIRE contract rules (pilot carding) was completed on June 24, 2023, by the USFS.

Bell 407 PIC

Air Shasta Rotor & Wing Inc. hired the PIC in February, 2018. The pilot's last flight review was completed on April 27, 2023. His last proficiency check for currency under CAL FIRE contract rules (pilot carding) was completed on June 20, 2023, by the USFS.

Aircraft and Owner/Operator Information (A1)

Aircraft Make:	Bell	**Registration:**	N555AS
Model/Series:	407	**Aircraft Category:**	Helicopter
Year of Manufacture:	2004	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	53591
Landing Gear Type:	Skid	**Seats:**	7
Date/Type of Last Inspection:	August 6, 2023 Condition	**Certified Max Gross Wt.:**	5250 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	4926.9 Hrs as of last inspection	**Engine Manufacturer:**	Honeywell
ELT:	C91 installed, not activated	**Engine Model/Series:**	HTS-900
Registered Owner:	AERO LEASING INC	**Rated Power:**	820 Horsepower
Operator:	Air Shasta Rotor & Wing Inc.	**Operating Certificate(s) Held:**	Rotorcraft external load (133), Commuter air carrier (135), Agricultural aircraft (137)
Operator Does Business As:		**Operator Designator Code:**	801U

Aircraft and Owner/Operator Information (A2)

Aircraft Make:	Sikorsky	**Registration:**	N4037S
Model/Series:	S-64E	**Aircraft Category:**	Helicopter
Year of Manufacture:	1975	**Amateur Built:**	
Airworthiness Certificate:	Transport; Utility	**Serial Number:**	64101
Landing Gear Type:	Tricycle	**Seats:**	3
Date/Type of Last Inspection:	July 29, 2023 AAIP	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Turbo shaft
Airframe Total Time:	18403.4 Hrs as of last inspection	**Engine Manufacturer:**	P & W
ELT:	C126 installed, not activated	**Engine Model/Series:**	JFTD12A-4A
Registered Owner:	SILLER HELICOPTERS INC	**Rated Power:**	4500 Horsepower
Operator:	SILLER HELICOPTERS INC	**Operating Certificate(s) Held:**	Rotorcraft external load (133), Agricultural aircraft (137), Certificate of authorization or waiver (COA)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KBMT,32 ft msl	**Distance from Accident Site:**	1.8 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	114°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots / None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	36°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hemet, CA (HMT) (A1); Hemet, CA (HMT) (A2)	**Type of Flight Plan Filed:**	
Destination:	Hemet, CA (HMT) (A1); Hemet, CA (HMT) (A2)	**Type of Clearance:**	None (A1); None (A2)
Departure Time:	18:34 Local (A1); 18:37 Local (A2)	**Type of Airspace:**	Class G (A1); Class G (A2)

Airport Information

Airport:	BANNING MUNI BNG	**Runway Surface Type:**	
Airport Elevation:	2222 ft msl	**Runway Surface Condition:**	Rough;Vegetation
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information (A1)

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	33.9143,-116.8067(est)

Wreckage and Impact Information (A2)

Crew Injuries:	2 None	**Aircraft Damage:**	Minor
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	33.9143,-116.8067(est)

A postaccident examination of the Sikorsky tire revealed that the right main landing gear tire had about a 24-inch-wide cut; however, the cut section of the rubber tire was not located. A rubber transfer mark was found on a 12-inch section on the leading edge of the Bell 407's main rotor blade. See figure 3.

Figure 3. Left photo - view of damaged tire on helicopter. Upper right photo - view of removed damaged tire. Lower right photo - view of damaged tire next to main rotor blade showing transfer mark.

Examination of the accident site revealed that the Bell 407 came to rest on a steep and rocky hillside about 1,050 ft from the last recorded ADS-B data point. See figure 4.

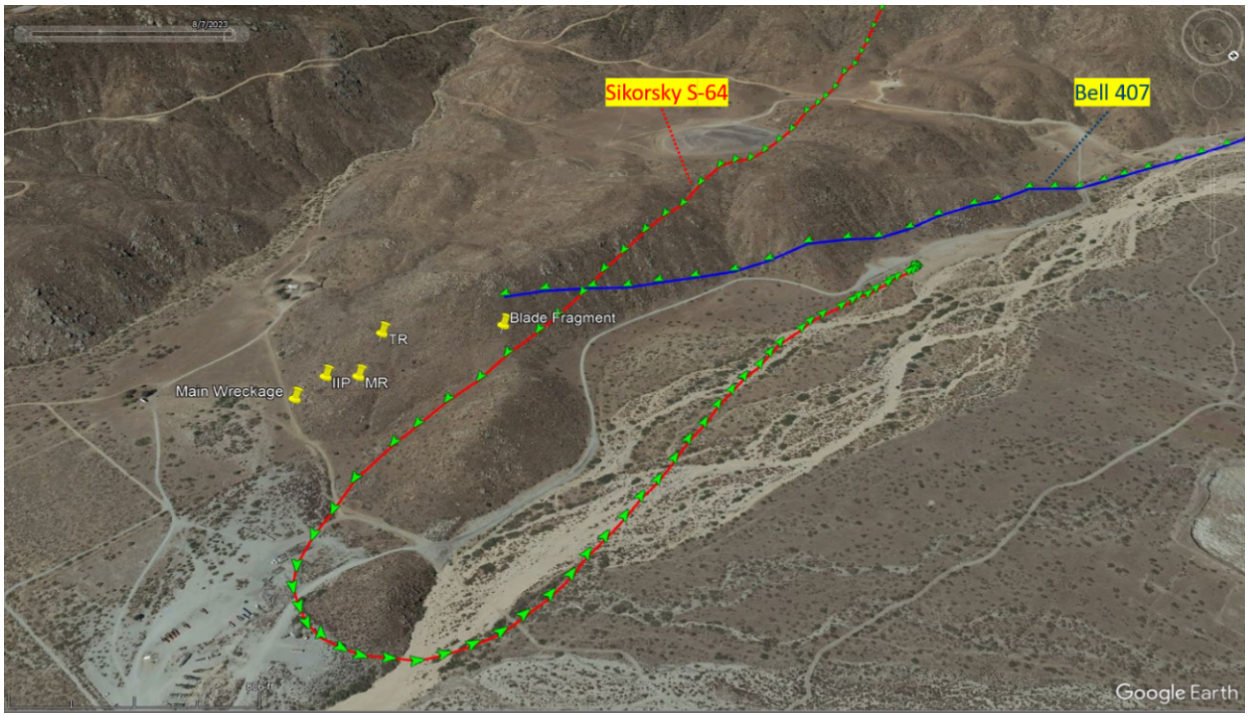


Figure 4. ADS-B flight plots with wreckage location markers.

A post-crash fire ensued after impact and consumed the fuselage of the Bell 407. The debris path was about 950 ft by 550 ft and contained all major components of the helicopter. The beginning of the debris path was identified by a piece of main rotor blade, which was about 560 feet east of the approximate collision area. Subsequent fragments of the main rotor blade were identified within a 100 ft span to the east. A displaced skid and crosstube came to rest about 195 ft east of the main wreckage and were the easternmost pieces of debris. About 830 ft southeast of the first blade component, a ground scar was consistent with the fuselage's first identified point of contact (FIPC). It was followed by a 20-foot-long ground scar, oriented on a 098° magnetic heading, that extended to the engine, which was displaced and located adjacent to rock boulders. See figure 5.

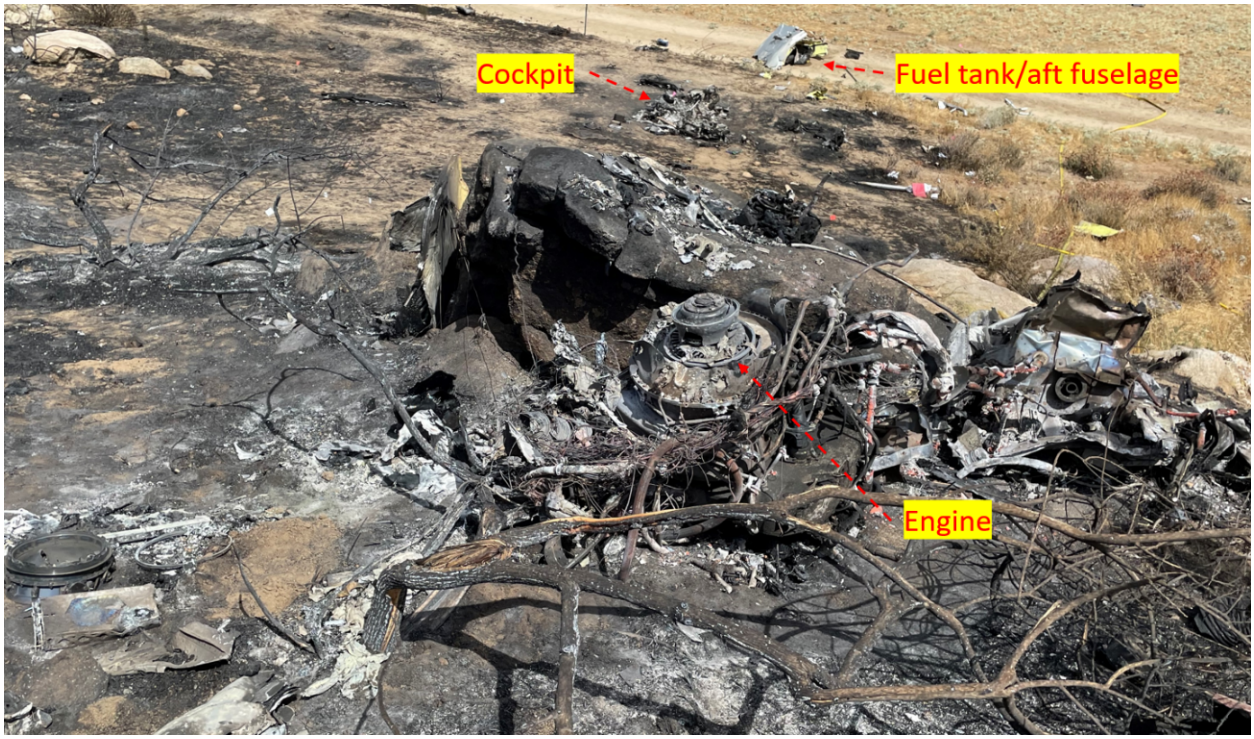


Figure 5. View of main wreckage.

The main wreckage was found about 45 ft east of the engine. The main rotor blades, mast, and transmission came to rest about 285 ft northwest of the main wreckage, upslope from the FIPC. The tail cone and tail rotor blade assembly came to rest about 470 ft west of the main wreckage. See figure 6.

Figure 6. Left photo - view of main rotor and transmission assembly. Right photo - view of separated tail boom.

A postaccident examination of the Bell 407's airframe did not reveal any pre-impact anomalies. Flight control continuity could not be established from the cockpit to the main transmission due to the post-crash fire. Flight control continuity from the transmission to all four main rotor blades was established. Flight control continuity from the driveshaft to the tail rotor blade assembly was established.

Examination of the recovered engine revealed that it sustained impact and thermal damage. The front frame, compressor, and combustion stages were partially separated and impact damaged; the power turbine rotor and casing were not recovered. The power output shaft remained connected to the engine, with fractures consistent with overload on the main/tail rotor outputs. The power output shaft manually rotated by hand. Indications of impact damage, both rotating and static, were consistent with the engine rotating during impact with terrain.

Testing of the recovered engine control unit revealed no anomalies with the controls on the power turbine governing loop before the collision; data was consistent with an operational engine. About 12 seconds into the recording, a rotor droop was captured as the initial event. The data then showed a rapid increase in torque and a torque fault without a significant change in collective pitch, consistent with the main rotor no longer being connected to the power turbine.

Communications

The National Wildlife Coordinating Group (NWCG) publication, *Standards for Airspace Coordination* (PMS 520), provided guidance that was current at the time of the accident for deconflicting airspace in firefighting operations. It stated that:

> *Agency personnel involved with a Fire Traffic Area (FTA) should be familiar with the NWCG Standards for Aerial Supervision, PMS 505, which provides detailed information about ingress, egress, and operating procedures. The FTA is a communication protocol for firefighting agencies. It does not apply to other aircraft that have legal access into a Temporary Flight Restriction (TFR) by the FAA per 14 CFR 91.137 (c.). The FTA should not be confused with a TFR, which is a legal restriction established by the FAA to restrict aviation traffic. The FTA is a communication tool establishing protocol for responding firefighting agencies*.

Approach procedures, as directed by the publication, *NWCG Standards for Aerial Supervision (*PMS 505), include (see figure 7):

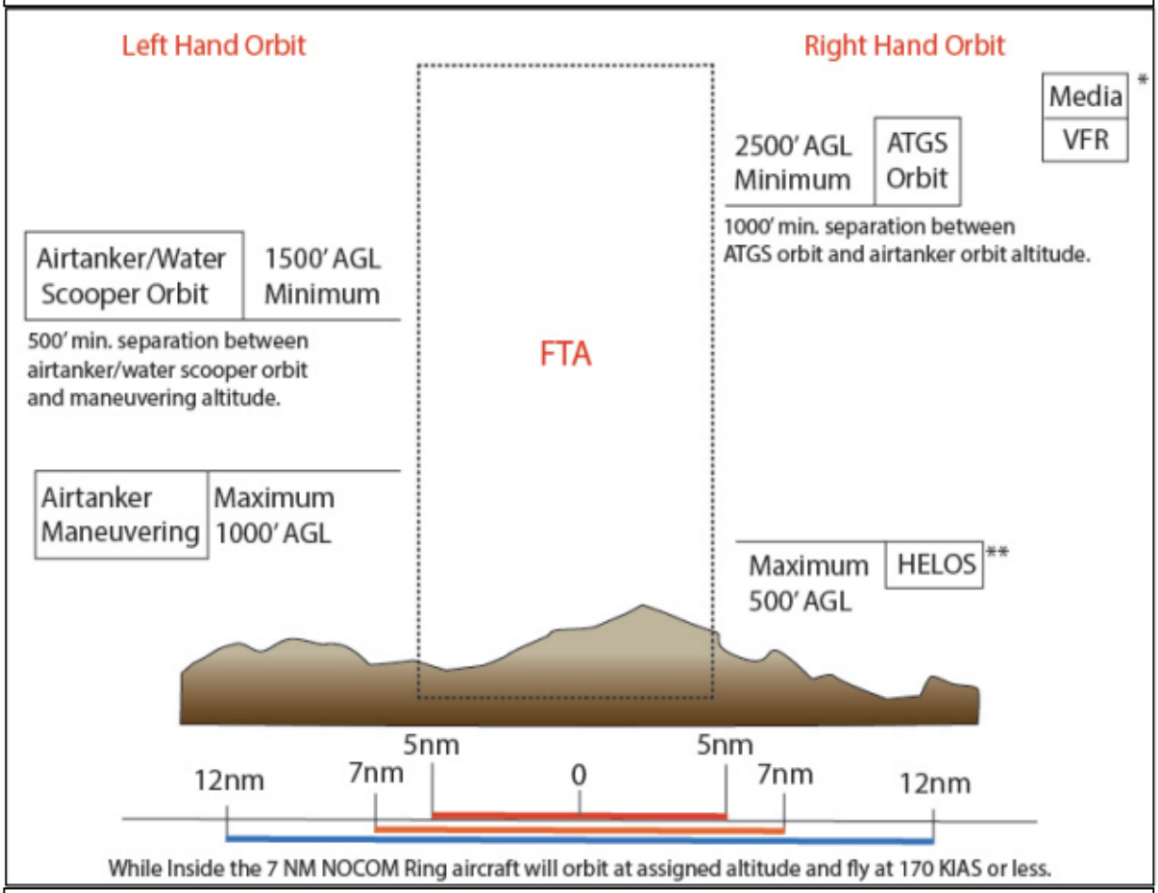
> *Initial Communication Ring (ICOM) – A ring 12 nm from the center point of the incident. At or prior to 12 nm, inbound aircraft contact the ATGS or appropriate aerial resource for permission to proceed to the incident.*
>
> *No Communication Ring (NOCOM) – A ring 7 nm from the center point of the incident that should not be crossed by inbound aircraft without first receiving clearance from the appropriate on-scene incident aircraft. While within the NOCOM ring aircraft will operate at established/assigned altitudes and remain at 170 KIAS or less.*

NWCG Fire Traffic Area (FTA)

***NWCG Standards for Aerial Supervision*, PMS 505,**
https://www.nwcg.gov/publications/505
Clearance is required to enter the FTA

Initial Radio Contact: 12 nm on assigned air tactical frequency.
No Radio Contact: Hold a minimum of 7 nm from the incident.

Note: Airtanker maneuvering altitude determines minimum airtanker and ATGS orbit altitudes. Assigned altitudes may be higher and will be stated as MSL.



* Media and IAA Aircraft: Maintain VFR separation above highest incident aircraft or at the altitude assigned by the controlling aircraft.
** Helicopters: Fly assigned altitudes, orbits, and routes.

Airtanker Base As Assigned	Air Guard 168.625 Tx Tone 110.9	Air to Air As Assigned	National Flight Following 168.650 Tone 110.9 TX and RX

PMS 505d (07/22) 1 of 2

Figure 7. Excerpt of NWCG PMS 505: Fire Traffic Area.

The publication also includes pilot responsibilities under *Chapter 8- Tactical Operations: Coordination and control* which states the following:

Pilots will advise the aerial supervisor:

• 12 nm from an incident – stating their distance, direction, and altitude.

Note: *Aircraft inbound to an incident will not proceed closer than 7 nm until Clearance to Enter is received from controlling aerial supervisor.*

• Arrival on scene.

Note: *Depending on fire size and complexity, "on scene" may include areas as far as 5 nm from 30 incident center coordinates.*

• When lifting off for helicopter missions.

• When moving between operating/target areas.

• When departing or re-entering an incident area.

• When changing radio frequencies.

• When encountering any unusual or unsafe situations.

• Before performing a non-standard maneuver.

Pilots are responsible for maintaining aircraft separation, radio contact, and adherence to correct flight patterns and altitudes.

Helicopter operations will be cleared and coordinated through the aerial supervisor. In absence of an aerial supervisor, helicopters will establish communications and a control procedure with air tankers to avoid possible conflicting flight paths.

Non-Standard Maneuver

A non-standard maneuver is an action by a pilot (and aircraft) performed in a way other than the standard method. Non-standard maneuvers are necessary at times when the standard method would be either unsafe or ineffective. It must be understood, however, that a non-standard maneuver may require the suspension of other ongoing operations. Some examples of non-standard maneuvers are:

• A target identification pass (high show-me profile) by the ATGS aircraft.

• An airtanker drop performed out of a right-hand pattern.

• ATGS aircraft flying a left-hand orbit.

• A helicopter flying a new or unassigned route within the incident boundary or above the helicopter ceiling altitude.

• Any aircraft deviating from the assigned or expected altitude.

Before a non-standard maneuver is executed:

• Non-standard maneuvers must be requested by the pilot intending to perform the maneuver.

• Non-standard maneuvers must be approved by the controlling aerial supervisor.

• All pilots of aircraft that may be affected.

CAL FIRE created and adopted further internal guidance for contract aircraft known as Contract Aerial Resource Standards (CARS). CARS provided aerial resource vendors, cooperators, and contract counties airworthiness and operational requirements, to include aircraft monitoring and communications and rules within the FTA.

The FTA is defined by CAL FIRE in CARS Chapter 13: Tactical Operations,

> *The airspace surrounding an incident is managed by the aerial supervisor who must implement FTA procedures. All wildland incidents, regardless of aircraft on scene, has an FTA. If an incident has an active Temporary Flight Restriction (TFR) in place, the FAA provides conditional control of the TFR to a controlling aircraft at-scene. Clearance from the controlling aircraft is required prior to TFR entry. If aerial supervision is not at scene, the first aircraft at scene will establish the FTA protocol.*

Chapter 13 also stated that all aircraft indicated airspeeds shall be no greater than 170 knots inside the Initial Communication Ring. After the aircraft's initial contact, briefing information is provided to the inbound aircraft by the aerial supervisor over the incident. CAL FIRE provided an example for all operators:

> ***Inbound Aircraft:*** *"Copter 104, 12 miles east at 1000 feet on Air Tactics 1."*
>
> ***Aerial Supervision:*** *"Copter 104, you are cleared into the FTA, at 1000 feet, maintain 500 feet at 5 miles, altimeter 29.92, followed by other traffic, assignment, known hazards, and frequencies…."*.

Furthermore, Chapter 13 stated that for helicopter operations within the FTA, "*pilots are responsible for maintaining visual separation from other aircraft and shall announce all intentions on the assigned frequency for situational awareness."*

Flight recorders

The Skycrane was equipped with an Appareo Vision 1000 and was recovered after the accident. Refer to the docket to access the Group Chair's Factual Report.

The Bell 407 was equipped with a Go-Pro Camera, an AIRS-400 Camera, and a Garmin 650. However, all of these items were thermally damaged and therefore unsalvageable for data download.

Medical and Pathological Information

The Bell 407 pilot's autopsy was performed by a forensic pathologist from Riverside County Sheriff's Office, Office of the Coroner, Perris, California. According to the pilot's autopsy report and associated death investigation documentation, his cause of death was blunt trauma and his manner of death was accident.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens recovered from the pilot. The pilot's postmortem toxicological testing detected no drugs of abuse and detected Cetirizine, an over-the counter antihistamine commonly used to treat allergy symptoms, in the blood and liver. Cetirizine often carries a warning that users may experience drowsiness and should be careful when driving a motor vehicle or operating machinery. Data on sedation and psychomotor impairment from cetirizine are mixed, with some studies finding some sedating and impairing effects. The FAA states that pilots should wait 48 hours after using cetirizine before flying, to allow time for the drug to be cleared from circulation.

Organizational and Management Information

The California Department of Forestry and Fire Protection (CAL FIRE) aerial division was tasked to the fire. Already on the scene of the fire were two S-2T tanker aircraft and a water-dropping helicopter under the control of the ATGS in an OV-10 Bronco. CAL FIRE had 2 additional helicopters not on scene under an exclusive use contract, which CAL FIRE defined as, "*private vendors providing aircraft that meet a forecasted demand filling a unique role or mission set.*"

Air Shasta Rotor and Wing, Inc. conducted Part 133 rotorcraft external load, Part 135 on-demand air-taxi, and Part 137 agricultural operations based in Redding, California. At the time of the accident, the Bell 407 helicopter was under an exclusive use contract and tasked to be an HLCO training flight Public Use aircraft. As stated in CARS Chapter 8: CAL FIRE Organization, the HLCO "*coordinates helicopter mission(s) and incident airspace, manages incident air traffic, and is the link between ground personnel and incident aircraft. The HLCO is an airborne firefighter who coordinates, assigns, and evaluates the use of aerial resources in support of incident objectives.*"

Siller Helicopters, Inc. conducted Part 133 rotorcraft external load and a Part 137 agricultural operations based in Yuba City, California. At the time of the accident, the Skycrane helicopter was an exclusive use contract and tasked as a firefighting (water-dropping) Public Use aircraft.

Administrative Information

Investigator In Charge (IIC):	Nepomuceno, Eleazar
Additional Participating Persons:	Beverley Harvey; TSB-Canada Matt McLuckie; Bell ; Fort Worth, TX Jennifer McDuffie; Honeywell; Phoenix, AZ Benjamin Berman; CAL FIRE Jake Marks; CAL FIRE Joshua Nettles; CAL FIRE Stuart Sprung; CAL FIRE Rod Glassford; Siller Casey Ross; Air Shasta Nelson Sanchez; FAA; Riverside, CA
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