

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Washington, D.C. 20594

April 13, 2012

Operations Group Chairman's Factual Report

A. ACCIDENT

Operator: Sundance Helicopters

Location: Approximately 14 miles East of Las Vegas, Nevada

Date: December 7, 2011

Time: 1630 Pacific Standard Time¹

Aircraft: Eurocopter AS350-B2, N37SH

NTSB Accident Number: DCA12MA020

B. GROUPS

The Operations Group was formed during the field phase of the investigation. Its participants are listed below.

Alex Lemishko - Group Chairman
Senior Air Safety Investigator
NTSB, Central Region

Paul R. Alukonis
Inspector/Accident Investigator
FAA, Las Vegas FSDO

Malcolm Brenner, PhD
Senior Human Performance Investigator
NTSB, Washington DC

Maryam Allahyar, PhD
Human Performance Investigator
NTSB, Washington DC

Seth Buttner
Senior Air Safety Investigator
American Eurocopter (AEC)

Kurt Barton
Director of Operations
Sundance Helicopters

Michael C. Flaherty
Director of Safety
Sundance Helicopters

Burl Boyd
Chief Pilot
Sundance Helicopters

¹ All times are Pacific Standard Time based on a 24-hour clock, unless otherwise noted.

C. SUMMARY

On December 7, 2011 at 1630 Pacific Standard Time, a Eurocopter AS350-B2, registration N37SH, operated by Sundance Helicopters as flight Landmark 57, crashed in mountainous terrain approximately 14 miles east of Las Vegas, Nevada. The 49 CFR Part 135 flight was a tourist sightseeing flight, which departed from Las Vegas McCarran International Airport (LAS), Las Vegas, NV, intending to fly to the Hoover Dam area and return to LAS, operating under visual flight rules. The helicopter impacted in a ravine in mountainous terrain between the city of Henderson and Lake Mead. The pilot and four passengers were fatally injured, and the helicopter was substantially damaged by impact forces and fire. Access to the accident site was moderately difficult and the investigators were assisted by the National Park Service. There were no installed on-board recording devices. Weather was reported as clear with good visibility and dusk light conditions.

Radar data obtained from the FAA show that the helicopter departed LAS and followed a normal route of flight easterly out of the LAS airport traffic area, then turned to the southeast toward Hoover Dam. Tour routings are standardized for all the area tour operators. The helicopter was level at 3,500 feet at approximately 120 knots. About one minute prior to the accident the radar indicated the helicopter climbed to 4,100 feet and turned about 90 degrees to the left. The left turn and climb are not part of the normal route. Radar then indicated the helicopter descended to 3,300 feet and tracked a northeasterly course for about 20 seconds, until entering a left turn then a descent of at least 2,500 feet per minute. The last radar target received was about 1/8 miles from the accident site.

D. DETAILS OF THE INVESTIGATION

The Operations Group convened at the Sundance Helicopters' headquarters located in Las Vegas, Nevada, on December 8, 2011, to conduct the field phase of the investigation. The group reviewed relevant documents and conducted interviews with company personnel and other persons to gather factual information regarding the accident. The Operations Group concluded the field phase of the accident investigation on December 12, 2011.

Subsequent interviews of the Sundance Helicopters' FAA principal operations inspector (POI) and Sundance Helicopters' Director of Safety were conducted during the week of February 20-23, 2012.

E. FACTUAL INFORMATION

1. Accident Flight Information

The accident occurred during a locally scheduled Part 135 air tour flight, specifically known as the Sundance "Twilight" Tour. The flight was intended to be a nonstop sightseeing tour of the Hoover Dam and the Las Vegas strip at sunset. The call sign for the flight was Landmark 57.

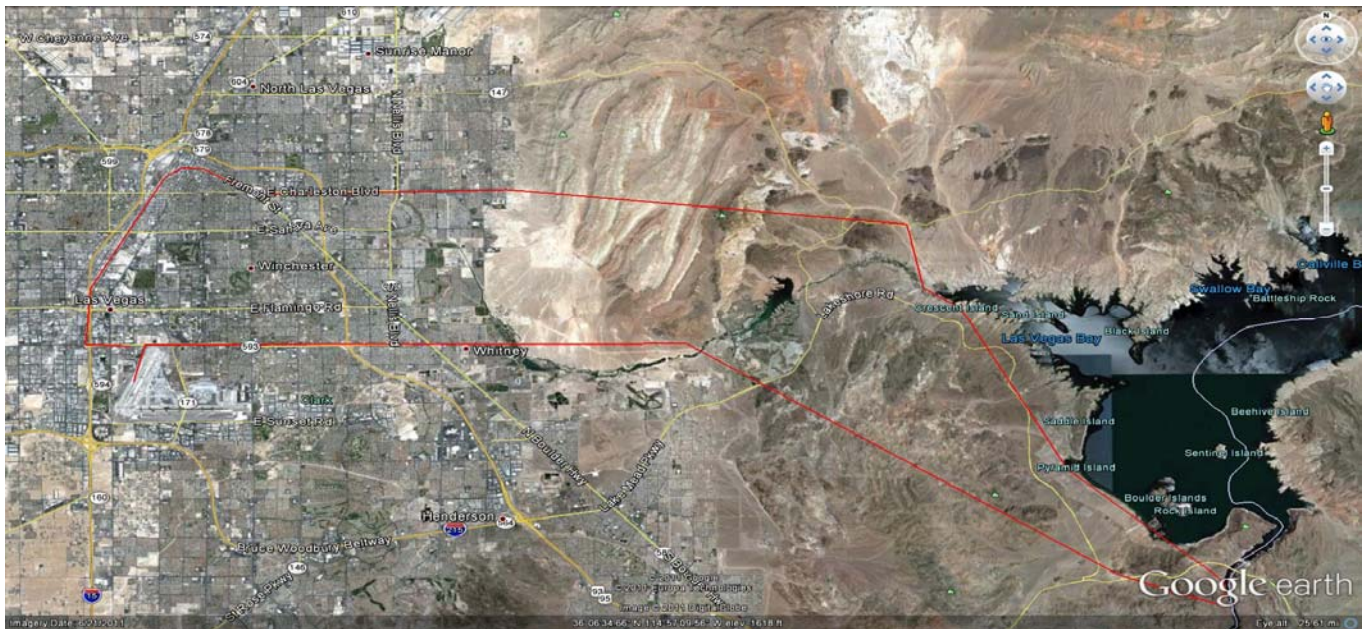
1.1 Twilight Tour Description

The tour begins from the Sundance ramp at Las Vegas McCarran International Airport (LAS). The departure time is set so as to make the return to LAS about 15 to 30 minutes after official sunset. The

pilot does not narrate the tour during the flight. There is a pre-loaded tour narration tape that is transmitted through the intercom to the passengers during the flight.

The helicopter departs the Sundance ramp and begins a climb to join the Tropicana Departure at 3,500' msl. Once the helicopter is 10 miles beyond the LAS VORTAC, a right turn is made to fly directly to the Hacienda Hotel Casino. At this point, the helicopter changes its designated departure transponder code to the VFR transponder code. The helicopter's altitude remains at 3,500' msl until clear of the ridgeline of the River Mountains. Once beyond the ridgeline, a gradual descent is established to be at 3,000' msl abeam the Hacienda Hotel Casino. The same heading is maintained until South of the Hoover Dam. A left turn is made to remain west of the Colorado River and South of the Hoover Dam. Once aligned with the Boulder Beach, a straight and level route at 3,000' msl is maintained to follow the shore line of Lake Mead, then direct to the entry point for the Callville Arrival back to LAS. The designated transponder code is again transmitted and a clearance is received from LAS Tower prior to entering Class B airspace.

The Tropicana Departure and the Callville Arrival are standardized helicopter routes established by the Las Vegas area Air Traffic Control (ATC) and the local helicopter operators. The routes are published in the "Las Vegas Terminal Radar Approach Control (L30), Las Vegas Airport Traffic Control Tower (LAS), North Las Vegas Airport Traffic Control Tower (VGT), and Signatories Letter of Agreement," dated 11/2/2011. The Twilight Tour route is depicted in 'red' on the chart below.



1.2 Accident Flight Track

Sundance Helicopters uses a satellite based tracking system called Spidertracks. Spidertracks is a small electronic device that has satellite tracking capabilities. The tracks are viewed on a web based

site, Spidertracks.com, by personnel authorized by Sundance². The tracks are utilized by Sundance management and safety personnel to ensure the consistency and quality of tour flights flown. The reporting rates are set by Sundance based on operational needs. The rates reported represent either 8 minutes or 20 km., whichever comes first. The Spider track for the accident flight was provided to the NTSB and is depicted in 'red' with an overlay of the prescribed Twilight Tour route is depicted in 'green' on the chart below.



1.3 Notifications of the Accident

There were no known eye-witnesses to the accident, however, there were two persons employed by the Southern Nevada Water Authority (SNWA) who were located in the vicinity of the crash and provided information to a local National Park Service (NPS) agent. The agent provided their information to the NTSB. Additionally, there were two Sundance helicopter pilots who were airborne at the time of the accident and provided the NTSB with their observations in written statements and interviews.

1.3.1 SNWA Employee Observations

The first SNWA employee was located near the west side of the Alfred Merritt Smith Water Plant when he heard the sound of a helicopter. He stated that he heard helicopters all the time when he was working, but this sound was described as similar to the engine screaming or redlining. He then heard a muffled thud, looked up, he saw a black plume of smoke near some regulating tanks by an access road. He noted the time as being 1638, contacted the National Park Service and drove toward the smoke. He got out of his vehicle and began walking but realized it was too far to walk so he returned to his vehicle and made a cell phone call to give directions to his dispatcher until the NPS ranger

² According to the Sundance Director of Operations, the Spidertracks serve as a useful tool for management to monitor the progress, location, and consistency of each flight. Each flight is monitored real time via a web based application at the base of operations. Track data for each flight is archived.

arrived. He stated that he only saw smoke but could not see any flames because his sight line was obscured by hills. He smelled what he thought was burning fuel.

The second SNWA employee was traveling on Lakeshore Road when he saw black smoke about four or five miles out to the west of the road. He reported that the sun was beginning to set but there was still plenty of light. He noted the time as a little bit after 1630 and called 911. He was transferred from the Las Vegas Metro Police to the Clark County Fire Department, at which time they told him that they were going to call the National Park Service.

1.3.2 Sundance Helicopter Pilot Observations

A Sundance helicopter pilot was airborne and returning from a tour flight (Sunset) in the vicinity of the accident. He recalled hearing a very short scream on frequency 120.65, descended to about 4,500 feet, and noticed brown smoke coming from the River Mountain area. He stated that he was the second to last aircraft returning from the Sunset Tours. He made a call to base on frequency 130.75 to see if all Landmark aircraft had reported in and was told that aircraft N37SH (Landmark 57) was on a Twilight Tour. He then returned to frequency 120.65 to attempt to contact Landmark 57. There was no answer. The visibility was unrestricted, so he decided to fly directly toward the smoke to investigate what was burning. Upon arrival he contacted Las Vegas Tower on frequency 123.82 to see if there was an ELT signal. Tower advised that there were no ELT signals. He then made 4 or 5 orbits around the fire, and there appeared to be a downed aircraft. The terrain was visible and he was able to make out the aircraft wreckage on the ground. The fire was about the size of ½ of a football field (50 yards), in a deep ravine and was burning "upslope". Repeated attempts to contact Landmark 57 were not successful. He then returned to the Sundance base.

Another Sundance pilot³ was returning from a tour flight when he heard a scream on the radio. He stated that it was short, sounded like someone in distress, sounded like a male voice, and sounded like a speaker close to the microphone (such as a pilot rather than a passenger). The scream was interrupted, like the un-keying of a microphone. Within 30 seconds, he witnessed intense smoke rising from the ground in an area ahead of him of undeveloped desert. He contacted the other airborne Sundance pilot (narrative above) and asked if he had seen any smoke. He remained on his course to return to base as the other helicopter flew toward the smoke to investigate. Repeated attempts to contact Landmark 57 were not successful.

Both pilots contacted base during the discovery of the smoke and accident site and the company missing aircraft plan was immediately engaged.

2. PERSONNEL INFORMATION

2.1 Pilot Information

The pilot was hired by Sundance on June 8, 2009. His hiring interview was conducted by the Chief Pilot, and the Director of Operations. At the time of hire, the pilot had accumulated 1,206 hours

³ This pilot was the MOC pilot who had conducted the post maintenance operational check flight of the accident helicopter prior to its first revenue flight of the day.

total helicopter flight time with over 1,000 hours of Pilot-in-Command (PIC) in helicopters. The Chief Pilot stated that he was a very clean cut, courteous young man and very happy about being hired at Sundance. He held a Commercial Pilot Certificate with Rotorcraft-Helicopter and Instrument ratings, issued on March 23, 2007. He also held a Flight Instructor Certificate with Rotorcraft-Helicopter ratings and a Ground Instructor Certificate. He held a Second Class Medical Certificate issued on June 1, 2011. The limitations/waivers on his medical certificate were indicated as "none."

2.1.1 Pilot Duty Assignment

The pilot was assigned the position of PIC for AS350B2 and EC130 aircraft. In addition, he was assigned duties within the Grand Canyon National Park (GCNP) SFRA airspace along the Green 4 route (SFAR 50-2).

2.1.2 Initial Training

Upon being hired, the pilot completed the company training program. His initial CFR Part 135.293 and 135.299 competency check was administered on June 19, 2009 with satisfactory results in the AS350 aircraft. The company check airman administered this test. On June 24, 2009, the pilot completed additional training and a Part 135.299 check to act as pilot in command in the Grand Canyon National Park airspace in accordance with SFRA 50-2. This route check was administered by company a company check airman with satisfactory results.

2.1.3 Recurrent Training

Recurrent training and check flights in the AS350 were completed on December 7, 2009. Approximately six months had passed since the initial training in lieu of the regulatory period of 12 months. According to the operator, the reason for the early recurrent training was to reinforce the previous initial training to enhance pilot knowledge and skill. This also may be a result of resetting the pilot's base month due to contract training by an outside vendor which is conducted in addition to the company's internal training program. The CFR Part 135.299 SFAR 50-2 check was completed on June 24, 2009, in accordance with the regulatory 12 month period.

On June 21, 2011, a SFAR 50-2 Part 135.299 check was completed with satisfactory results. This competency check was administered by a company check airman. The next regulatory check would have been due in June of 2012. The pilot received a Part 135.293 check in the EC130B4 on November 18, 2011. This Check was administered by a company check airman.

According to the records kept by the operator, the pilot was appropriately rated and medically qualified throughout his employment with Sundance. The pilot was qualified to act as pilot-in-command of the AS350 and EC130 aircraft in 14 CFR Part 135 operations, Part 136 operations, and the Grand Canyon National Park airspace. The airman was current in qualification and, according to company records, adhered to the appropriate flight and duty time limitations.

The pilot's most recent Part 135.299 SFAR 50-2 check occurred on June 21, 2011, with satisfactory results. Although the qualifications to operate in the Grand Canyon National Park airspace was not

applicable or pertinent to the accident flight, the pilot was qualified to act as pilot in command along the Green 4 route within the special flight rules area of the Grand Canyon. The pilot did fly the Green 4 route on the flight prior to the accident.

The air traffic in the vicinity of the Grand Canyon National Park is governed by 14 CFR Part 93 and Special Federal Aviation Regulations (SFAR) 50-2. Operators who operate in the Grand Canyon airspace must comply with the Grand Canyon Operations Manual. The manual specifies all authorized routes and procedures for those routes. Green Routes are helicopter routes. The Green 4 route is a helicopter route that the Las Vegas area tour operators use. In order for a pilot to operate an aircraft as pilot-in-command along a specific route it is mandatory to receive training and checking on the same route. This route check is a 14 CFR 135.299 check specific to the route described in the Grand Canyon Operations Manual. This line check is commonly called a 50-2 line check or Green 4 line check.

2.1.4 Transition Training

On March 5, 2010, the pilot completed initial transition training and flight checks for the EC130B4 aircraft. This was followed by a Part 135.299 route check completed on June 15, 2010. On January 21, 2011 a recurrent check flight was completed for the EC130B4 aircraft within the regulatory 12 month period.

2.1.5 Current Qualification

On December 10, 2010, a recurrent check flight in the AS350 was completed within the normal regulatory 12 month period. This competency check was administered by a company check airman. The month of December 2011 was the airman's due month for the AS350 recurrent training. Although planned, no recurrent training had been documented prior to the accident. On December 6th the pilot attended a portion of ground training; however this had not been documented in the records. Post-month recurrent training would have been due by the end of January 2012; therefore, the pilot was current and qualified (operationally and medically) per FAA and company requirements to fly as PIC at the time of the accident.

2.1.6 Flight and Duty Time Information

On December 7, 2011, the day of the accident, the pilot had flown approximately 1.7 hours. He flew a Sundance "Picnic Tour" to the Grand Canyon at 13:30 with a flight time of approximately 1.4 hours. On his next flight of the day (the accident flight), a Twilight Tour, the pilot logged 0.3 hours prior to the accident. He arrived on duty at 12:30 and planned to log off duty time of 17:15, according to the duty log. The estimated duty period for the day would have been 4.8 hours.

The previous day (December 6, 2011), the pilot's duty time was logged from 07:00 to 17:15, a duty period of 10.3 hours. He logged 4.3 hours of flight time on this day. On the 4th and 5th of December the pilot was off duty. The following flight times were listed on the company Pilot Duty Record: (The flight times below do not include the approximate flight time of 1.7 hours accumulated on the accident date.)

- December: 7.1 hours
- November: 59.2 hours
- Calendar quarter: 130.0 hours.
- Last two consecutive quarters: 362.9 hours.
- Calendar year 2011 total: 696.2 hours.

According to the pilot's Annual Resume, which was completed by the pilot on December 1, 2010, he had logged 2,478 hours of flight time. About 845 of these hours were flown in the previous 12 months. His total flight time listed on this form was added to his total flight time for the calendar year of 2011. This sums to approximately 3,174 total flight hours, with 1,360.6 hours of PIC flight time in the AS350 helicopter.

- Flight time last 90 days in AS-350-B2: 128.2 hours
- Flight time last 30 days in AS-350-B2: 36.0 hours
- Flight time last 24 hours in AS-350-B2: 4.4 hours

2.1.7 Pilot's Recent Work History (Information provided by the Chief Pilot)

The pilot worked December 3, 2011. He logged in at 0600 and began his annual recurrent AS350 ground training with a Sundance Instructor pilot. He flew a 1230 Sundance "Escape Tour" and was scheduled for a 1445 "Sunset Tour" that was cancelled due to weather. That evening the pilot and his wife attended the Sundance Helicopter Holiday party. The pilot had December 4th and 5th off and returned to work on December 6th at 7am. He flew a 0800 Picnic tour followed by a 1230 Escape tour on an EC130 helicopter. At 1445 he flew a Sunset tour on an AS350 helicopter. He departed Sundance base at 1715 at the end of his duty day.

The pilot reported to work at 1230 on December 7th. His first flight was a 1330 Picnic tour on the accident aircraft. His passengers arrived on time and he greeted them on time. He escorted them to the helicopter, and provided the required briefing as per FAA regulations, and boarded them on the aircraft. He departed with one other aircraft, completed the tour, and returned and landed at 1537. He escorted his passengers to the lobby, arranged for fuel, and removed his meal kits from the aircraft. He rested in the pilot room for awhile and then met his passengers for the next flight. They arrived on time and were escorted to the aircraft and were given the required safety briefing as per FAA regulations. He departed at 1621 for his Twilight tour.

The chief pilot stated that there were no out of the ordinary issues for any of the last weeks that the pilot worked.

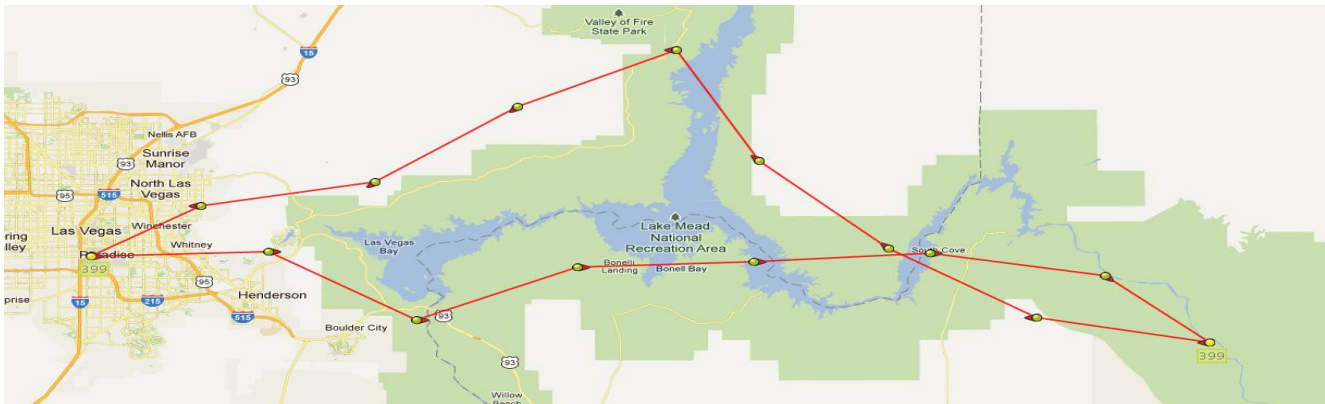
2.1.8 Pilot's Spider Tracking of Tour Flights Flown by the Pilot for 2 Weeks Prior to the Accident

Spidertracks from some of the pilot's recent flights were provided to the NTSB by the company.

12/3/11 1240 Escape Flight in N350SH



12/6/11 0829 VIP Flight in N399SH (VIP is a different route, but track is proper per Sundance)



12/6/11 1235 Escape Flight in N230SH



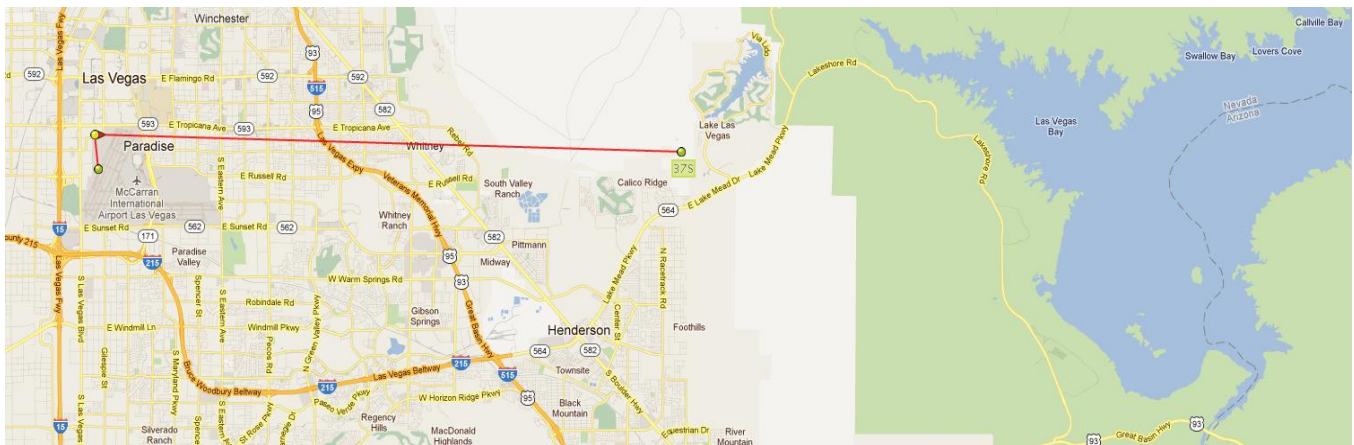
12/6/11 1446 Picnic Flight in N230SH



12/7/11 1328 Picnic Flight in N37SH



12/7/11 1621 Twilight in N37SH (Final Flight)



3. HELICOPTER INFORMATION

3.1 Configuration and Seating

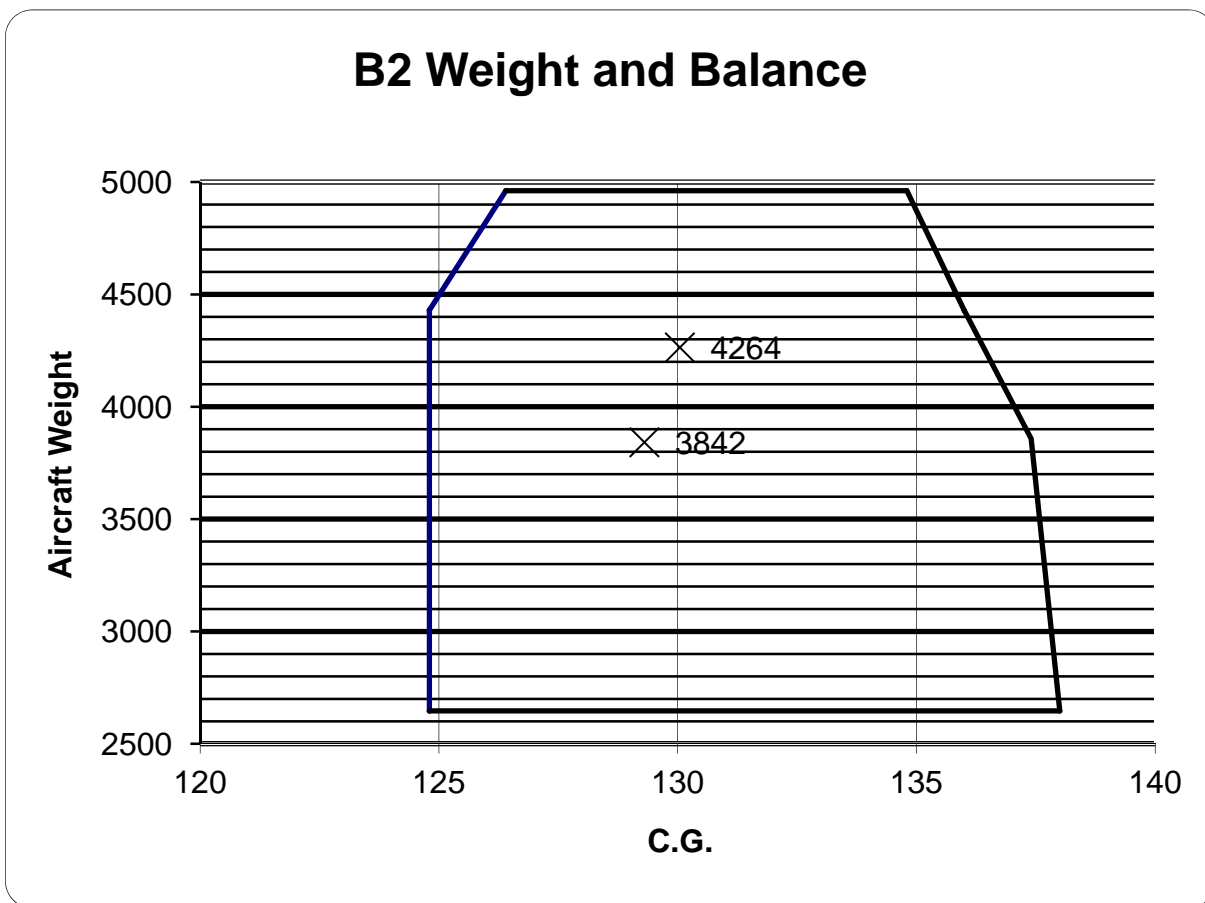
The helicopter was configured with a left seat, pilot-in-command station. The pilot's restraint consisted of a four point harness system. The right forward passenger seat was a Eurocopter Canada Dual Front Passenger Seat configured for two occupants. The rear seats were standard four-place bench seating. All passenger seats were equipped with Eurocopter standard seat restraint systems. The aircraft was configured for one pilot and 6 passenger seats. The aircraft was equipped for dual control capability for the purpose of flight training; however, the dual flight controls were not installed during the accident flight or any other tour flights. The aircraft had the standard interlocking two door pair configuration on both sides of the aircraft. This pair consisted of hinged forward cabin door and a hinged sub-door on each side of the aircraft. The standard side baggage compartment doors and standard windows were installed on the aircraft. The pilot occupied the front left pilot seat. The two front passenger seats were occupied by a couple (passengers 1 and 2). Two of the four available rear seats were occupied by an additional couple (passengers 3 and 4). It is unknown which of the four rear seats were occupied. Although the above mentioned passenger seating arrangement would have been most probable, the seating arrangement was at the discretion of the pilot and was not confirmed.

3.2 Performance / Weight and Balance for N37SH (Accident Flight)

The helicopter was within its prescribed weight and balance limitations for the accident flight.

Tour Empty Weight		2924	142.5	416622
Pilot		190	61.0	11590
Front Seats		314	67.5	21195
Aft Seats		317	102.0	32334
Pilot+Pax	821			
Baggage		40	181.1	7244
T/O Fuel	50%	479	136.8	65534
T/O Gross Weight		4264	130.0	554519
Landing Fuel	6%	57	136.8	7791
Landing Gross Wt		3842	129.3	496776

N37SH



Date/Time Computed	OAT	PA	HIGE	HOGE
12/7/2011 16:11	5	2000	4961	4961

3.3 Operations of N37SH on the Day of the Accident

On the morning of the accident, the helicopter (N37SH) was just out of a 100-hour inspection in the night before. In addition to the 100-hour inspection requirements, during the inspection the engine was changed, the fore-aft servo was changed, and the tail rotor servo was changed. During this time, a 400-hour inspection was also completed on the engine. After maintenance released the aircraft, a maintenance operational check (MOC) was required. The pilot who conducted the MOC flight reported to work at 0545 and took possession of N37SH at 0615 from maintenance. A preflight was conducted using the Eurocopter Rotorcraft Flight Manual (RFM) normal procedures in addition to specific checks on the areas where maintenance was conducted.

During the preflight inspection prior to the test flight, the MOC pilot discovered that the tension on the belt for the hydraulic pump was loose, the batteries for the flashlight needed to be replaced, and the window cleaner bottle was missing. The MOC pilot reported that after a maintenance technician checked and re-tightened the hydraulic belt, he re-inspected the belt, completed his preflight, and continued with the MOC. He stated that there were no tools left in the gearbox compartment, and the remainder of the MOC was successful with the aircraft operating within normal parameters. According to company records, the flight portion of the MOC was conducted from 0703 to 0717. The MOC pilot stated that he performed a power check at the end of the flight and confirmed that the engine was operating properly. After the flight, the pilot performed a post flight inspection and the helicopter was returned to service.

The pilot who conducted the MOC was scheduled to fly the helicopter at 0945 on a Picnic Tour with a full load of 6 passengers to the Grand Canyon (GC) which required landing and shut down of the engine. He departed the Sundance base at 0943 and landed at the GC Bluff location at 1026 for the picnic and shut down. After re-boarding the passengers for the return flight, the pilot conducted a walk around check, started the engine, and departed the Bluff at 1108. The helicopter landed at Sundance base at 1147, and left the flight log on the pilot seat for the next pilot. The pilot reported that the aircraft handling was very normal and felt fine during the tour and added that any differences in performance should have been noticeable when comparing a full load to flying alone, and the handling felt fine. He stated that there was no feedback on the cyclic, none at all. The position of the cyclic stick was not at all unusual, and he felt comfortable with its position. After the flight, he checked for any oil or leaks around the aircraft or engine compartments or gearbox.

The helicopter was scheduled to be flown by the accident pilot on another Picnic Tour to the Grand Canyon at 1330. According to Sundance records, the accident pilot started duty at 1230 and took possession of the helicopter at 1250 at which time he conducted his preflight. He met his passengers at 1315, briefed them, boarded them on the helicopter, and did a walk around check. The helicopter departed Sundance base at 1328 and landed at the GC Bluff location at 1410. The helicopter departed the Bluff at 1500 and landed at Sundance base at 1537. The accident pilot escorted his passengers to the lobby, arranged for fuel for his next flight, and removed his meal kits from the aircraft. He rested in the pilot room and then met his passengers for the next flight at 1615. The helicopter departed Sundance base at 1621 for the Twilight Tour (the accident flight).

4. Company Operating Procedures

The following information was extracted from the Sundance Helicopters General Operating Manual (GOM), Sundance Approved Operations Specifications (OpsSpecs), and in interviews with the Director of Maintenance, Director of Safety, and the Chief Pilot.

4.1 Post Maintenance Dispatch Procedures

Only company trained and approved pilots were authorized to perform Maintenance Operational Checks (MOCs). Sundance, at the time of the accident, had 12 post maintenance operational check pilots (both EC130 and AS350 qualified). Sundance added 3 additional operational check pilots after the accident.

Upon being assigned an MOC flight, the pilot inspects the aircraft log to determine the exact nature of any maintenance that has been conducted. The pilot then consults with maintenance to determine the extent of the completed maintenance. The MOC pilot insures that all write ups in the aircraft log have been signed off by maintenance.

The MOC pilot then conducts a thorough preflight, with extra emphasis placed on the areas where maintenance has been conducted. If any discrepancies are noted, the MOC pilot coordinates with maintenance to take corrective action. Note: On the morning of the helicopter's post-maintenance check flight, the MOC pilot had verified the required checks to be performed after an engine replacement with the Director of Safety.

The MOC pilot references Chapter 8.3 of the Eurocopter RFM for the recommended procedures and required checks. The pilot completes all checks required by Chapter 8.3 for the maintenance items completed and completes the Power Assurance Check and systems checks contained in Supplement 14 of the corresponding RFM. After starting the aircraft, when ready to depart on the MOC, the pilot calls base and informs them that he/she is departing on the MOC, fuel on board, the pilot's name, estimated time enroute, and names of any maintenance personnel on board (if any).

After completion of the MOC, the pilot completes all required documentation, confers with Maintenance if any further action is needed, completes the required sign off in the aircraft log, and if the aircraft is returned to service, notifies operations of its availability.

4.1.1 Internal Company Operational Check Pilot Training Program

According to the Director of Operations, to ensure an added level of safety and quality control, operational check flights of aircraft being returned to service are only conducted by pilots who have completed the operator's supplemental training program. This training program, Maintenance Operational Check Training (MOC), is not regulatory. However, the operator has placed emphasis on pilot training as a part of quality control to ensure the aircraft functionality in accordance with the Eurocopter test sheet listed in Section 8 of the Flight manual.

4.2 Company Preflight Procedures

Eurocopter defines daily operating checks to the basic aircraft (Preflight Checklists), into three separate types of checks: Check before the first flight; Check in conjunction with flight; Check after the last flight of the day. The most comprehensive is the **After Last Flight Inspection (ALF)**. The next less detailed inspection is the **Before First Flight Inspection (BFF)**, and a **Turn Around Check (TA)** inspection is used for cursory reexaminations between flights on the same day. These checks are listed in the Eurocopter Flight Manual in Section 8.4, and the Turn Around Check is also listed in Section 4.1 of the Flight Manual.

It is common practice for industry maintenance technicians to conduct the **ALF** inspection. The **BFF** inspection is a recommendation for pilots to complete prior to the first flight of each day, while a **TA** inspection is conducted throughout the day prior to each flight conducted.

According to Eurocopter's Flight Manual, daily checks must be conducted in accordance with standard aircraft practices and the appropriate manufacturer's recommendations, by qualified maintenance personnel or by a specially trained pilot.

Sundance had expanded the manufacturer's preflight checklist to include additional items. The company checklist (Sundance Helicopters AS350B2 Flight Manual Expanded External Checks Checklist), involves comprehensive checks of supplemental devices and equipment installed on the aircraft. The expanded checklist complements the manufacturers' lists, and incorporates the company's operational procedures.

4.2.1 Preflight Inspections of N37SH on the Day of the Accident

Event	Approx Time	Preflight Type	Flt Time	Notes	Post Flight
MOC	0615	BFF Inspection	0.23	Local Area Test Flt	Yes, BFF
Air Tour	0930	TA Inspection	1.4	Picnic Tour*	Yes, TA
Air Tour	1250	TA Inspection	1.4	Picnic Tour*	Yes, TA
Air Tour	1600	TA Inspection	0.2	Twilight Tour**	

*Additional TA Checks are required prior to departing the Grand Canyon on Picnic Tour flights.

**Accident Flight

4.2.1.1 Table Definitions

BFF: Before First Flight Inspection. The required preflight as outlined in the Eurocopter AS350 B2 Flight Manual section 4.1 External Checks. Additionally, Sundance pilots are required to open all cowlings and perform a visual inspection to the main rotor gearbox area as well as the engine area as part of this daily routine. In the event an aircraft has undergone any maintenance activity, Pilots are required to place special emphasis on visually inspecting the serviced components.

TA: Turn Around Check Inspection: Outlined in the Eurocopter AS350 B2 Flight Manual section 4.1 Turn Around Check. The Turn Around check consists of the following: Check of vital fluids, rapid inspection of main and tail rotor blades, security of all cargo, proper latching of all doors and cowlings.

Note: During the course of the field phase of the investigation, at the accident site, the airworthiness group discovered that the cyclic servo connection hardware (bolt, nut, cotter key) were missing. This servo connection should be clearly visible during a preflight inspection, specifically when the pilot opens the left main gear box (MGB) cowl for access. On the day of the accident, the left MGB cowl was opened twice to perform a **BFF** inspection by the MOC pilot, before and after the MOC flight. The left MGB cowl was not opened, nor was it required to be opened during routine **TA** preflights for the remainder of the day. An excerpt from Sundance guidelines (Expanded External Checks Checklist, dated February 9, 2011) for inspection of the left MGB area is listed below.

Left MGB Cowl

- MGB support struts – check security, no damage, free to rotate and security.
- MGB oil level in view. Cap on, correct fluid level, and locking arm in place.
- Fuel filter bypass – check bypass button not visible, no fuel leaks, fuel shut off for security.
- MGB Temperature & Chip detectors- secure.
- “Dog Bone” - check for security and torque stripes.
- Push Pull control rods, accumulators & solenoids for Hydraulics – check not leaking or damaged.
- MGB oil lines to fan – check security and not leaking.
- FFCL cable – check condition.
- Rotor brake – check condition and security.
- Air conditioner compressor – check security, check clutch is free to turn, and no excess oil on cowling wall from wheel.
- Nr phonic sensor – check security.
- MGB deck – check general condition of deck for fluid leaks and tools.
- Cowl Door - check closed and secured.



Pilot conducting a preflight inspection of the left MGB area



Left MGB inspection area



Fore-aft servo connecting hardware visible through the cutout of the ice boot (about eye-level for a pilot inspecting the left MGB area)

5. Federal Aviation Administration Oversight of Sundance Operations / Staffing

Sundance Helicopters has one Principal Operations Inspector (POI) to oversee its flight operations. The POI is a staff member of the Las Vegas Flight Standards District Office (FSDO). The POI stated that he was acting in his capacity for the past 7 years. He characterized Sundance operations personnel as being compliant and professional in the conduct of flight operations. During unannounced visits to Sundance over the past year, the Director of Operations, Chief Pilot, and Director of Safety always gave him total access to conduct his site inspections. He stated that he conducted visits often and many were unannounced. He stated that if discrepancies were found, Sundance management was cooperative to correct and discuss the issues in a proactive manner and that Sundance had implemented a viable and functioning SMS program that had helped to identify risk areas.

A review of the FAA Program Tracking & Records System (PTRS) by the NTSB showed a total of 84 PTRS entries for the year prior to the accident. These entries show an active involvement of the POI at the Sundance base of operations. The POI did not have an assistant POI assigned, but did not think that it impacted his effectiveness.

In addition to Sundance (50 pilots and 23 aircraft), as part of his duties at the Las Vegas FSDO, the POI managed the following Part 135 certificates at the time of the accident:

- High Roll Air – 1 pilot and 1 aircraft
- Las Vegas Helicopters – 1 pilot and 1 aircraft
- Maverick Helicopters – 60 pilots and 35 aircraft
- Zeppair – 1 pilot and 1 aircraft
- Unlimited Aviation – 1 pilot and 1 aircraft

The POI also managed one Part 141 certificate, one Part 137 certificate, and two Part 133 certificates.

5.1 FAA FSDO Staffing

The assistant manager of the Las Vegas FSDO stated that his office was stable and proactively engaged with its operators. He reported that the overall staffing of the FSDO was down 10 inspectors (6 operations and 4 airworthiness), but said that the current staffing levels did not adversely affect daily operations. He stated that the FAA region overall was up 3 inspectors.

6. Company Organization and Safety Culture

6.1 Sundance Management Organization

The Chief Executive Officer (CEO) manages the Director of Operations (DOO) and the Director of Maintenance (DOM). The CEO reports to the owners of the company. The Director of Safety (DOS) reports directly to the CEO as do the DOO and DOM; however, the DOS has a direct line of communication to the CEO and works with the DOO and DOM on a daily basis. The Chief Pilot reports directly to the DOO and manages all line pilots, instructor pilots, and check airmen.

6.2 Company Safety Program / Culture (Information Provided by Sundance Director of Flight Safety)

Although Sundance Helicopters has had an active and formal Safety Program in effect for many years, in early 2010, the CEO approached the Safety Manager, and discussed the benefits of elevating the Safety Program to a formal Safety Management System (SMS). As a result of this commitment, the incumbent Safety Manager, who was also an active line captain, began working on the development of a formal SMS. In January 2011, the Safety Manager launched the SMS program. The Safety Manager's position was elevated by the CEO to "Director of Safety." As a result of this elevated position, the Director of Safety would now focus full time on managing the SMS and his line captain duties were reduced to a minimum.

The Director of Safety provided the NTSB with detailed records of the SMS and stated that the program has greatly helped to identify areas of improvement over the last year. A review of the SMS records showed that routine safety activities and communications within the organization and with the FAA were documented, acted upon appropriately, and disseminated to the appropriate company employees.

6.2 Historical Company Information (excerpts from a letter to the NTSB)

On September 20, 2003 a Sundance Helicopter was involved in a fatal accident near Grand Canyon West Airport (GCW), about 80 nautical miles west of Las Vegas, Nevada. The Eurocopter AS350BA was being operated on a short shuttle route between the Grand Canyon Airport and a landing site beside the Colorado River. The route from the airport to the river landing site was via a narrow canyon called Descent Canyon. On the pilot's 11th flight through Descent Canon that day, with six passengers on board, the aircraft hit a near vertical wall and was destroyed by the impact and subsequent fire. There were no survivors.

The National Transportation Safety Board (NTSB) conducted an investigation and determined that the probable cause of the accident was "the pilot's disregard for safe flying procedures and misjudgment of the helicopter's proximity to terrain". The report also cited Sundance Helicopters and the Federal Aviation Administration for inadequate surveillance of air tour operations in Descent Canyon.

The management of Sundance at the time believed that they had a strong operations team, proper operating procedures and a good safety program. The findings in the NTSB report, however, exposed shortcomings in all three areas.

The following actions were implemented:

1. Replacement of the director of operations with an experienced individual recruited from outside the company with experience in Parts 121, 125, and 135.
2. Descent Canyon was closed to helicopter operations and has not been reopened to this date.
3. Sundance's operating procedures were reviewed and significant changes made, largely in conjunction with the route change for GCW shuttle operations. (The company stated that operating procedures were in place at that time that would likely have prevented the accident if they had been followed by the pilot)
4. Surveillance of flight operations was improved to include:

- A passenger survey system was implemented
- A surreptitious "ride along" program employing knowledgeable aviators was implemented
- A video system was installed on each aircraft and a sampling of the videos reviewed by operations supervisors. Unfortunately, the storage devices for the video system are no longer available so we are developing a replacement system for the video system.
- Operations supervisors were required to conduct regular surveillance of GCW operations and route compliance.

5. A zero tolerance safety policy was adopted. That is; any pilot caught operating outside of Sundance policy guidelines would be terminated immediately.

6. The pilot selection process was revised. Background checks and references were given a high priority, and actual selection done by a committee of operations managers and supervisors.

7. A new Training Captain was hired and given the task of rewriting and implementing a new Sundance training syllabus with a strong emphasis on thoroughness and safety.

8. The installation of scales was implemented to measure the actual weight of passengers rather than using the OpSpecs approved method of using the declared passenger weight plus 10 pounds.

9. The pilot pay structure was changed to de-emphasize making tips to earn a decent living.

10. The absolute forbidding of any type of "thrill flight" and making it well known that any indication of this type of "cowboy" flying would result in immediate termination.

11. The installation of a passenger audio system that plays a recorded narration and music for the entire flight (currently 11 languages) to insure the pilot's workload is manageable.

The company reported that its yearly flight hours have steadily increased since 2003 without sacrificing safety and quality.

2003	16,365.7
2004	17,881.2
2005	20,069.9
2006	23,362.2
2007	25,810.1
2008	25,623.2
2009	24,957.0
2010	28,029.4
2011	29,826.1 through November

Sundance currently averages a total of 53 tour flights and 90 GCW shuttle flights per day during the summer and 35 tour flights and 40 GCW shuttle flights during the winter. Since January 1, 2003, Sundance Helicopters has carried 618,802 tour passengers and the passenger and flight counts at the Grand Canyon West facility have increased to as many as 900 passengers and 180 flights using up to 6 helicopters per day.

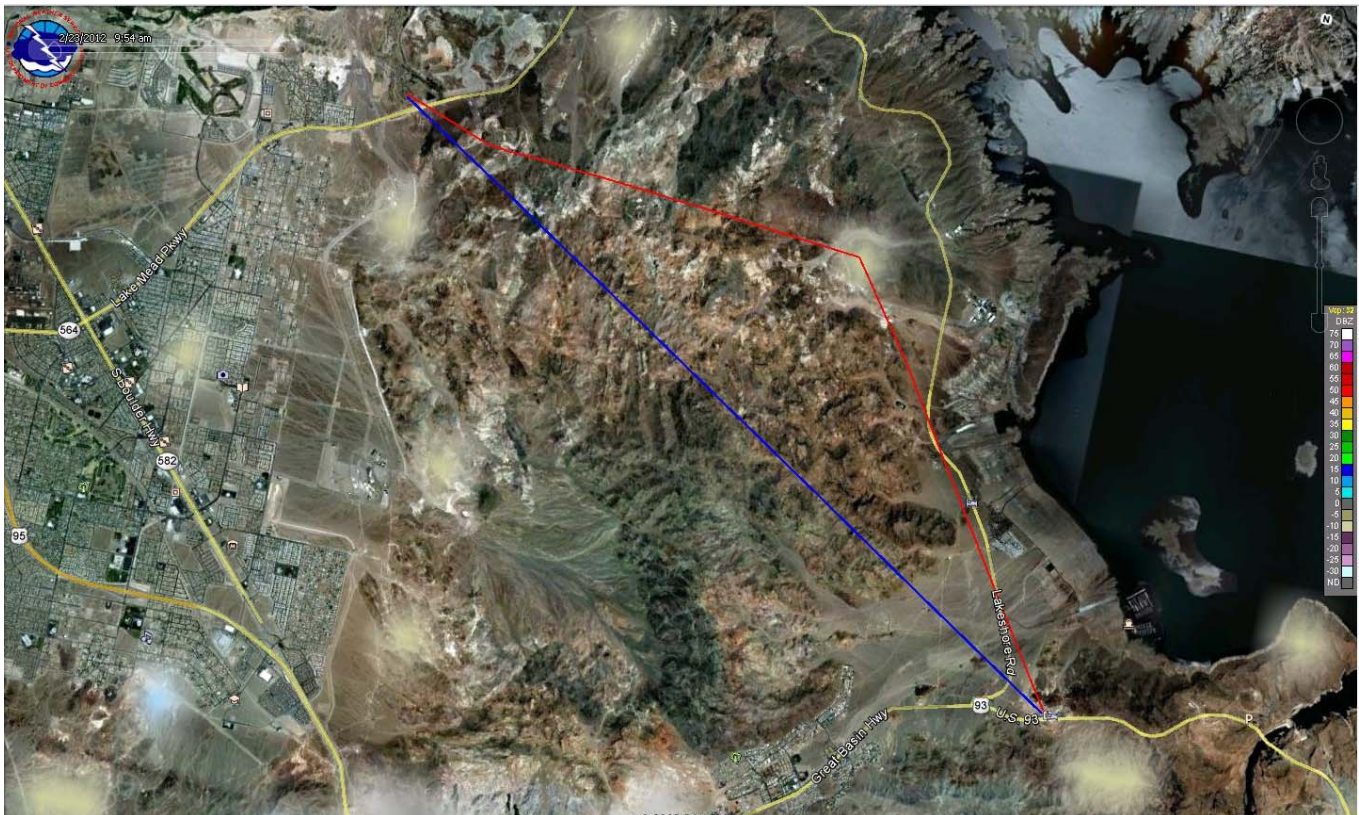
6.3 Helicopter Air Tour Industry (Las Vegas)

Sundance, along with 2 other major helicopter air tour operators (Maverick and Papillon) operate out of Las Vegas McCarran International Airport. Collectively, the 3 operators have about 85 helicopters in service, employ approximately 170 pilots, and fly over 100,000 hours per year. The average number of helicopter air tour passengers flown per year out of the Las Vegas location is over 500,000.

7. Post Accident Changes in Sundance Flight Operations

As a result of the accident, Sundance Helicopters implemented several changes to their operating procedures and have updated their GOM. These changes were posted in a Sundance inter-office safety memorandum that was given to the NTSB.

- Conduct a more thorough post-flight inspection following any MOC or FCF flight.
- Specifically, re-inspect (visually) any replaced components.
- Document all post-flight inspections in the maintenance log.
- Slightly alter air tour flight routing in the vicinity of the River Mountains to the north. This will provide quicker access to relatively flat terrain in the event of an unscheduled landing. The new route was also adopted by the other 2 helicopter tour operators on the Las Vegas strip.



Modified Tour Route (new route is in 'red')

F. Attachments

Attachment 1	Pilot Operator Report 6120
Attachment 2	Twilight Tour Description with Flight Track Overlay
Attachment 3	Spidertrack Raw Data for Accident Flight (N37SH)
Attachment 4	National Park Service Incident Record of Telephone Interviews
Attachment 5	Sundance Pilot Statements
Attachment 6	Sundance Chief Pilot Statement
Attachment 7	Pilot's Training Records
Attachment 8	Pilot's Flight and Duty Time Records
Attachment 9	Pilot's Archived Flight Tracks
Attachment 10	Weight and Balance Sheet for the Accident Flight (N37SH)
Attachment 11	Sundance Approved Operations Specifications (OpsSpecs)
Attachment 12	Sundance General Operations Manual (GOM) Chapter 6 Flight Operations
Attachment 13	AS350B2 Rotorcraft Flight Manual (RFM) Section 4 Normal Procedures
Attachment 14	AS350B2 Rotorcraft Flight Manual (RFM) Section 8.4 Daily Operating Checks
Attachment 15	AS350B2 Rotorcraft Flight Manual (RFM) Section 8.3 Flight Test Sheets
Attachment 16	AS350B2 Rotorcraft Flight Manual (RFM) Supplement 14
Attachment 17	Sundance Expanded External Checks Checklist for AS350B2
Attachment 18	External Safety Audits (DOD and TOPS)
Attachment 19	Internal Safety Audit (SMS)
Attachment 20	Letter from Sundance Helicopters to the NTSB
Attachment 21	Sundance Safety Memorandum Outlining Post Accident Safety Initiatives