

# 「100%可預防」的飛航事故

本文係基於NTSB飛航事故編號ANC20MA010的最後調查報告摘要：「撞擊到地形障礙物；Safari航空公司，空中巴士AS350 B2直升機，編號N985SA；夏威夷，Kekaha山區；2019年12月26日。」以及相關文件等。

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美國「國家運輸安全委員會」(National Transportation Safety Board，後文簡稱NTSB)表示，美國「聯邦航空總署」(Federal Aviation Administration，後文簡稱FAA)對他們所提的幾項安全建議「應作為而不作為」，導致2019年有一架AS350直升機，在夏威夷山區發生墜毀的致命飛航事故。

一位擁有15,700多小時飛行時間的直升機飛行員，駕駛他的AS350 B2空中巴士直升機，在夏威夷Kauai島飛進低雲和下雨的天氣中；直升機在撞擊山腰的墜毀前，飛行員失去關鍵性的目視參考，造成空中旅遊觀光的飛行中，在2019年發生直升機墜毀、飛行員和所有6名乘客罹難的致命飛航事故。

美國NTSB指出，飛行員在天氣惡化的情境下繼續飛行，雖然是發生飛航事故的「可能肇因」(probable cause)之一；但更強調的是，美國FAA未能實施NTSB早就提出的一些安全建議，應該是發生墜機飛航事故的肇因。

2019年12月26日，NTSB主席Jennifer Homendy女士在週二舉行的會議上說：「有些人可能會覺得，這一切都是飛行



圖示：致命飛航事故現場，位於夏威夷山區一側(畫圈處)。

員的責任；畢竟，這是他自己所做的決定。」在討論到促成因素時，她補充說：「我最擔心的是，飛航監管機構缺乏領導素養、安全行動，以及監督能力；根據法律，監管機構必須把確保飛航安全，列為最高的優先事項。」

美國NTSB列舉FAA的不當之處，諸如：「對夏威夷空中旅遊觀光業者，以及有關天氣的實際作業，缺乏有效的監督和查核程序。」、「為夏威夷空中旅遊觀光業者的飛行員，發展基於天氣提示的訓練計畫，缺乏領導素養。」，以及「為夏威夷空中旅遊觀光業者，安裝航空氣象攝影機計畫，因故延後而未能實施。」

空中旅遊觀光業者 Safari 航空公司的不當之處：「對飛行員在非預期性的從『目視飛航規則』(Visual Flight Rules, VFR) 飛進『儀器氣象條件』(Instrument Meteorological Conditions, IMC) 的空域中，其相關風險與影響因素，以及危險識別與降低風險等作業，缺乏安全管理程序。」

「這場致命的悲劇，雖然早晚都會發生；但這是 100% 可以預防的。」NTSB 主席 Homendy 女士補充說：「美國 FAA 沒有實施 NTSB 曾經提出的一些安全建議；如果那些建議能夠獲得實施，就可以避免墜機的飛航事故。」

### 當天的第8次飛行

致命的飛航事故 — 那次飛行是飛行員當天的第 8 次，也是最後一次的預定 50 分鐘空中旅遊觀光飛行 — 一起飛離開 Lihue 機場的時間是 1631 時。這架直升機沒有安裝駕駛艙語音記錄器、數位飛行數據記錄器，或是飛行追蹤器等設備；但該地區的其他空中旅遊觀光飛行員提出報告說，有聽到他兩次報告直升機的目的地，包括在 1645 時，當時他說他在「Mic 檢查點」 — 那是空中旅遊觀光航線的一個強制性報告點，表明那架直升機正離開 Waimea 峽谷，在飛越 Koke'e 州立公園，前往 Na Pali 海岸的航線途中。

1731 時，在這個時間點的 10 分鐘之前，那架直升機就應該飛返 Lihue 機場；因此，Safari 航空公司的飛行管制官提出報告：直升機逾時未歸，並開始搜索其行蹤。直到第二天，在州立公園樹木繁茂的山坡上，發現了被燒毀的直升機殘骸。事故調查人員無法確定，飛行員是否失去了對直升機的操控能

力，或者是因為能見度低，無法看到地形而把直升機撞上障礙物。

一名在公園徒步旅行的目擊者，告訴事故調查人員：墜機時的能見度，在雨霧中約為 20 英尺。NTSB 的事實調查報告進一步說明：目擊者聽到一架直升機的滯空懸停聲音，然後是高音調的嗥鳴聲，當時他的直覺是「有些不對勁」；但當他試圖去找直升機時，卻無法做到，因為當時的天氣和「天色已逐漸轉暗」。

有關 Kauai 島的天氣分析，NTSB 事故調查的總結報告說：「在一天的大部分時間裡，都有利於空中旅遊觀光；然而，就在發生事故的航班起飛之前，低雲和下雨開始從西北方朝向陸地移動。」調查報告進一步說明：這種「非典型天氣模式」，影響了部分的空中旅遊觀光航線；然而當天，至少另有三位執行空中旅遊觀光的飛行員，偏離了通常空中旅遊觀光的航線，以避免遭遇到惡劣的天氣。

「然而，發生飛航事故的飛行員，決定繼續他的空中旅遊觀光航線，因而飛進了惡化的天氣，最後在直升機撞擊地形障礙物之前，失去了足夠的目視參考，」調查報告補充說：「飛行員決定繼續飛進惡化的天氣，可能是他缺乏相關的天氣資訊，以及對非典型天氣模式的認知；也有可能是，他評估飛行中的天氣狀況不準確，或是對自己的飛行能力過度自信。」

調查報告進一步表示：這位飛行員擁有 15,718 小時的飛行時間，更是 Safari 航空公司的首席飛行員和檢定機師，但卻沒有儀器飛行的證照；那架 1998 年製造的直升機 —

「就像大多數用來執行空中旅遊觀光的直升機一樣」— 沒有配備相關儀器，用來幫助飛行員在能見度差的情況下，以保持定位方向和飛機操控。

夏威夷 Kauai 島的空中旅遊觀光航線，在山區沿線的飛航基礎設施有限，無法支援安全的低空操控作業；調查報告特別指出：「當地的天氣觀測來源相當稀少，以及空對地無線電通信和飛行追蹤技術等裝備，亦會遭到地形的干擾。」

### 「缺乏領導素養」

該調查報告批評美國 FAA：「對夏威夷空中旅遊觀光業者，發展基於天氣提示的訓練，缺乏領導素養和專家指導，」並補充說明其結果：「Safari 航空公司的飛行員訓練計畫，係由 FAA 位於檀香山的飛行標準分區辦公室所批准的，但卻沒有為該公司的飛行員提供 FAA 基於天氣提示的訓練研究類型，這可以有效提升飛行員準確評估飛行中的天氣狀況，以及避免遭遇危險的操控技能。」

該事故調查促使 NTSB 發佈了 10 項新的安全建議，包括向 FAA 提出關於改善夏威夷飛航基礎設施的建議，以獲得持續性的無線電通信和飛行追蹤性能，才能更有效地監督夏威夷空中旅遊觀光的業者，並且要求他們：「為其機隊安裝飛行追蹤性能的裝備，以及……提供主動飛航監控的訓練有素公司與支援飛航的專業人員。」

其他的安全建議，係呼籲 FAA 「採取積極行動，這將會有助於所有的空中旅遊觀光業者和飛行員，避免發生天氣相關風險的實際作業情境。」具體的積極行動，包括發展

適當的公司安全管理系統，以及直升機產業界和空中旅遊觀光業者的安全單位，採用為安全而設計的科技裝備，以防止非預期性的飛進「儀器氣象條件」(IMC) 下的空域，因而發生不幸的飛航事故。

NTSB 還重申過去曾對 FAA 所提出的一些安全建議，包括有關在夏威夷安裝航空氣象攝影機的建議；要求夏威夷空中旅遊觀光業者的飛行員，進行基於天氣提示的訓練；要求空中旅遊觀光業者，實施「安全管理系統」(Safety Management System, SMS) 和飛行數據監控計畫；要求安裝「墜機殘存」(crash-resistant) 飛行記錄系統等。

「當 NTSB 發佈安全建議時，我們是採用『數據導向』(data-driven) 的模式，而其支援係來自於調查所獲得的事實證據，並經由精心的規劃與設計，以防止飛航事故的發生。」Homendy 主席說：「在此飛航事故發生之前，NTSB 曾向 FAA 提出 11 項安全建議，以防止類似事故的再發生；但我們的建議，只有在具體實施之後才會有效。因此，現在正是 FAA 採取積極行動的時候了。」



譯自：Aero Safety World May 16, 2022

## ‘100 Percent Preventable’

### The NTSB says FAA inaction on several safety recommendations contributed to the fatal 2019 crash of an AS350 on a Hawaii mountainside

Linda Werfelman

A 15,700-hour helicopter pilot flew his Airbus Helicopters AS350 B2 into low clouds and rain on the Hawaiian island of Kauai and lost sight of key visual references before the helicopter crashed into a mountainside, killing the pilot and all six passengers on a 2019 sightseeing flight. The helicopter was destroyed.

The U.S. National Transportation Safety Board (NTSB) cited the pilot’s continuation of the flight into deteriorating weather as the probable cause of the accident, but emphasized that the failure of the U.S. Federal Aviation Administration (FAA) to implement a number of NTSB safety recommendations contributed to the crash.

“Some might feel this was all on the pilot; it was his decision, after all,” NTSB Chair Jennifer Homendy said during a Tuesday meeting on the Dec. 26, 2019, crash. In discussing the contributing factors, she added, “The most concerning to me is the lack of leadership, safety action and oversight provided by the regulator, which is charged by law with maintaining safety as the highest priority.”

The NTSB cited the FAA’s “ineffective



The accident site, on the side of a Hawaiian mountain, is outlined in circle.

monitoring and oversight of Hawaii air tour operators’ weather-related operating practices,” its “lack of leadership in the development of a cue-based weather training program for Hawaii air tour pilots” and its “delayed implementation of a Hawaii aviation weather camera program.”

The operator, Safari Helicopters, was cited for its “lack of safety management processes to identify hazards and mitigate the risks associated with factors that influence pilots to continue VFR [visual flight rules] flight into IMC [instrument meteorological conditions].”

“This tragedy should not have occurred; it was 100 percent preventable,” Homendy said, adding that the FAA has not implemented

past NTSB safety recommendations that, had they been implemented, could have prevented the crash.

## **Eighth Flight of the Day**

The accident flight — the pilot’s eighth and final scheduled 50-minute sightseeing flight of the day — left Lihue Airport at 1631. The helicopter did not have a cockpit voice recorder, digital flight data recorder or flight tracking equipment, but other air tour pilots in the area reported hearing him report the helicopter’s destination twice, including at 1645, when he said he was at “Upper Mic” — a compulsory air tour reporting point that indicated a helicopter was leaving Waimea Canyon and flying through Koke’e State Park on the way to the Na Pali coast.

At 1731, 10 minutes after the helicopter should have returned to Lihue, the Safari Helicopters flight follower reported the helicopter overdue, and a search began. The burned wreckage was found the next day on a heavily wooded mountain slope in the park. Investigators were unable to determine whether the pilot lost control of the helicopter or, because of low visibility, flew the helicopter into terrain that he was unable to see.

A witness who had been hiking in the park told accident investigators that visibility at the time of the crash was about 20 ft in rain and fog. The NTSB’s factual report said the witness heard the sound of a hovering helicopter and then a high-pitched whine and

knew that “something was wrong,” but when he tried to find the helicopter, he could not because of the weather and “the fading daylight.”

An NTSB summary report said the weather on Kauai had been “favorable for tours for most of the day; however, just before the accident flight departed, low clouds and rain began moving onshore from the northwest.” The report said that this “atypical weather pattern” affected parts of the tour route, and at least three other air tour pilots diverted from the usual flight path to avoid the bad weather.

“The accident pilot, however, decided to continue his tour into deteriorating weather, eventually losing adequate visual references before the helicopter struck terrain,” the report said, adding, that “his decision to continue the flight into deteriorating weather was likely influenced by a lack of relevant weather information and an atypical weather pattern, and it’s possible that he inaccurately assessed the weather conditions in flight or was overconfident in his abilities.”

The pilot, who had 15,718 flight hours and was Safari’s chief pilot and check airman, had no instrument rating, and the helicopter, which was manufactured in 1998, was — “like most helicopters typically used for air tours” — not equipped with instruments that would help a pilot maintain orientation and aircraft control in case of poor visibility, the report said.

Mountainous areas along the air tour route in Kauai have limited infrastructure to support safe low-altitude operations, the report said, noting the “sparse weather observation sources and terrain interference with air-to-ground radio communications and flight-tracking technology.”

### **‘Lack of Leadership’**


The report criticized the FAA’s “lack of leadership and expert guidance in developing cue-based weather training for air tour operators in Hawaii,” adding that as a result, Safari Aviation Inc.’s pilot training program, which was approved by the [FAA’s] Honolulu Flight Standards District Office, did not provide Safari’s pilots with the type of training that the FAA’s cue-based training research determined was effective for improving pilots’ skills for accurately assessing and avoiding hazardous in-flight weather conditions.”

The accident investigation prompted the NTSB to issue 10 new safety recommendations, including recommendations to the FAA regarding infrastructure improvements in Hawaii to allow for continuous radio communications and flight tracking, better surveillance of Hawaiian air tour operators and requirements that operators “equip their fleets with flight tracking capabilities and ... provide active flight monitoring by trained company flight support personnel.”

Other recommendations called on the FAA to “take actions that can help all air tour

operators and pilots prevent a drift toward risky weather-related operating practices.” Specific actions include the development of appropriate company safety management systems and the adoption by the helicopter industry and air tour safety organizations of safety technologies designed to prevent accidents following inadvertent entry into IMC.

The NTSB also reiterated past safety recommendations to the FAA, including those involving the installation of aviation weather cameras in Hawaii, requiring cue-based weather training for Hawaiian air tour pilots, requiring air tour operators to implement SMS and flight data monitoring programs, and requiring the installation of crash-resistant flight recorder systems.

“When the NTSB issues safety recommendations, they are data-driven, supported by factual evidence developed from investigations and are carefully crafted to prevent accidents,” Homendy said. “The NTSB previously made 11 recommendations to the FAA to prevent accidents like this one, but our recommendations only work when they are implemented. It’s time for the FAA to act.” 

This article is based on the NTSB’s synopsis of its final report on Accident No. ANC20MA010, “Collision Into Terrain; Safari Aviation Inc., Airbus AS350 B2, N985SA; Kekaha, Hawaii; December 26, 2019,” and associated documents. The full final report is expected to be published within several weeks.

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