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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

DCA-90-MA-005

Date: November 21, 1990

In reply refer to: A-90-142

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On October 28, 1989, Aloha IslandAir, flight 1712, a de Havilland DHC-6-300, Twin Otter, N707PV, collided with terrain near Halawa Bay, Molokai, Hawaii, while en route on a scheduled passenger flight from the Kahului Airport, Maui, Hawaii, to Kaunakakai Airport, Molokai, Hawaii. The flight was conducted under visual flight rules (VFR) and under the provisions of 14 CFR Part 135. The aircraft was destroyed; the two pilots and all 18 passengers received fatal injuries.[1]

On October 28, 1989, about 1837 Hawaiian Standard Time, Aloha IslandAir, flight 1712, a de Havilland DHC-6-300, Twin Otter, N707PV, collided with mountainous terrain while en route on a scheduled passenger flight from the Kahului Airport, Maui, Hawaii, to Kaunakakai Airport, Molokai, Hawaii. The flight was conducted under visual flight rules (VFR) and under the provisions of 14 CFR Part 135.

Official sunset occurred about 1753, while the aircraft was at Kahului, civil twilight lasted until 1816, and nautical twilight until 1842.[2] No problems or unusual circumstances were reported by the crew or noted by ground personnel.

At 1825, flight 1712 departed Kahului on a VFR flight plan and was scheduled to arrive at Kaunakakai at 1850. The departure clearance specified a departure heading of 320° and an altitude of 1,000 feet mean sea level (msl).

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[1] For more detailed information read, Aviation Accident Report--"Aloha IslandAir, Inc., Flight 1712, de Havilland Twin Otter, DHC-6-300, N707PV, Halawa Point, Molokai, Hawaii, October 28, 1989" (NTSB/AAR-90/05)

[2] "Night" is the time between the end of evening civil twilight and the beginning of morning civil twilight; "Civil Twilight" is the period of time between when the upper edge of the sun is on the horizon and when the center of the sun is 6° below the the horizon; "Nautical Twilight" is the period of time when the center of the sun is between 6° and 12° below the horizon.

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At 1826:52, the flight radioed the local controller that it was airborne and climbing through 400 feet for a cruise altitude of 1,000 feet. At 1827:15, departure control advised the flight, "Radar contact resume own navigation." At 1827:27, flight 1712 leveled off at an altitude of 1,000 feet. Radar data indicated that approximately 3 minutes later the flight began to descend out of 1,000 feet at a rate of about 250 feet per minute. The airplane leveled off at 500 feet at 1832:34. At 1833:13, flight 1712 was about 16 miles northwest of the Kahului Airport and clear of the ARSA. Departure control informed flight 1712 that radar contact was lost and instructed it to squawk transponder code "1200," which is the VFR transponder code. The flightcrew acknowledged the transmission. This transmission was the last one known from flight 1712.

The radar data from radar sites on Oahu showed that the flight operated at a ground speed of approximately 140 knots during its climb to 1,000 feet. After reaching 1,000 feet, the flight's ground speed increased to about 165 knots. At 1832:39, after the flight leveled at 500 feet, ground speed decreased to approximately 150 knots. This speed remained nearly constant until contact was lost with the target.

Radar data revealed that flight 1712's track progressed on a heading of about 320^{0} to a point about 2 miles east of the Island of Molokai, where it then turned westerly to a heading of about 260^{0}. The flight remained at 500 feet until contact was lost with the target at 1836:36.

There were no eyewitnesses to the subsequent crash of flight 1712. Flight 1712 was declared missing about 1930, and an immediate search and rescue effort was commenced. The wreckage was found the next morning on the northeastern slopes of the coastal mountains on the island of Molokai at around 600 feet. The accident occurred about 1837, during the hours of darkness, at 21^{0} 10′ north latitude and 156^{0} 44′ west longitude.

The investigation determined that the accident occurred about 6 minutes before the end of nautical twilight. During this time, only a very dim horizon and the brightest stars are visible. There were very few lights on the ground and no navigational lights on the eastern end of Molokai. Therefore, the island of Molokai and the clouds over Molokai might only have been detectable to the pilot as an occlusion on a dim horizon.

The investigation determined that there was an orographic cloud[3] over the northeastern end of Molokai, created by the northeast trade winds. Based on witness observations and analysis of meteorological conditions, the base of the cloud was about 500 feet above sea level and the top was about 4,500 feet. Precipitation was observed under the cloud, probably in the form of drizzle or very light rain because of the shallow depth of the cloud.

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[3]An orographic cloud is developed by air forced aloft by rising terrain and cooled adiabatically to saturation. The cloud is constantly being generated on the upwind slope of the terrain and dissipated on the downwind slope of the terrain, making it appear stationary.

The Safety Board concludes that at the time of the accident it was too dark to avoid the clouds by visual reference and therefore it was unsafe to continue VFR flight near Halawa Point. The Safety Board further concludes that the flight entered clouds and continued into high terrain that was obscured by the clouds. The captain might have been able to see the phosphorescence of the surf braking on the shore of Molokai. However, the forward visibility would have been severely limited by precipitation, clouds, and darkness.

The 500-foot ceiling over the eastern (windward) end of Molokai was considerably lower than the 2,000-foot ceiling predicted by the Area Forecast, and IMC conditions existed in this region below 4,500 feet. Consequently, the Safety Board concludes that the weather forecast valid at the time of the accident was incomplete, because it did not include the possibility of low cloud conditions along the intended route of the accident flight.

The captain's previous experience in the Hawaiian Islands should have made him familiar with and aware of the possibility of orographic clouds in this mountainous area. However, if the forecast had been accurate, the captain could have been informed of the likelihood of orographic clouds and he might have filed an IFR flight plan or altered his course to avoid the eastern end of the island. Therefore, the Safety Board concludes that National Weather Service reports should include the possibility of orographic clouds whenever conditions exist that would create such clouds.

Shortly after leaving the Kahului ARSA, flight 1712 descended to 500 feet, an altitude that did not comply with 14 CFR Part 135 or with Aloha IslandAir's operating procedures for night operations. The flight progressed on a heading of about 320^{0} to a point about 2 miles east of Molokai, where it turned to a heading of approximately 260^{0}, a heading consistent with paralleling the north shore of Molokai.

Based on the flight track, the Safety Board concludes that in the reduced visibility conditions of darkness, low clouds, precipitation, and with the lack of lighted visual reference points on the ground, the captain of flight 1712 visually mistook the surf breaking on Cape Halawa for the portion of land known as Lamaloa Head. Believing that the flight had passed north and east of Lamaloa Head, the captain commenced a turn to a westerly heading to parallel the north shore of Molokai. This error of misidentification caused the flight to enter into the north side of the Halawa Valley at an altitude substantially lower than the height of the terrain.

The Safety Board believes that rather than trying to continue the VFR flight at 500 feet above the water, the prudent action would have been for the captain to have filed IFR enroute. The Safety Board notes that the flight could have flown air route "Victor 6" to Plumb intersection and then air route "Victor 22" to Kaunakakai Airport. This IFR flight path would have added only a few minutes to the total flight time, but it would have ensured that the flight was at a safe altitude and distance from the mountainous terrain on the eastern end of Molokai.

The investigation found that the flight path of flight 1712 did not comply with the requirements of 14 CFR Section 135.203 in that it was operating at less than 1,000 feet above the highest obstacle within a horizontal distance of

5 miles. Flight 1712 did not comply with this regulation when it let down fr 1,000 feet after clearing the Maui ARSA. As the flight approached to within 5 miles of Molokai, it was again not complying with this regulation.

As a result of the Safety Board's investigation of an accident involving a Beechcraft B-99A,[4] Safety Recommendation A-89-91 was issued to the FAA on August 11, 1989:

> Restrict 14 CFR Part 135 air carrier (fixed-wing) passenger flights from operating in uncontrolled airspace under visual flight rules (VFR) in less than the basic VFR weather minimums of a 1,000-foot ceiling and 3 miles visibility.

In its response dated October 23, 1989, the FAA stated that it believes that the current requirements of 14 CFR Section 135.205 are adequate. The FAA further stated that it did not plan to take any further action regarding this recommendation. The Safety Board believes that scheduled 14 CFR operations should be required to be conducted under instrument flight rules when low ceilings (less than 1,000 feet) or low visibilities (less than 3 miles) are forecast, reported, or encountered enroute. Therefore, the Safety Board classifies Safety Recommendation A-89-91 as "Closed-Unacceptable Response-Superseded."

The Safety Board maintains that passengers on board scheduled 14 CFR Part 135 flights are entitled to the additional safety margin provided by IFR requirements. Currently, 14 CFR Part 135 requires that the airplanes used in these operations are to be equipped for IFR flight and the pilots to be IFR rated. Therefore, there is no reason that scheduled 14 CFR Part 135 flights could not be operated IFR.

The Safety Board's examination of the captain's background established that a pattern of unprofessional behavior had existed and that similar behavior continued following the captain's employment by Aloha IslandAir. The first documented event occurred 5 years before the accident, resulting in a 180-day suspension of his commercial certificate for conducting a commercial flight in violation of the competency requirements of the FARs and for reckless or negligent operation of an aircraft.

Two previous employers reported that the captain had developed careless and unsafe practices as a result of his attitude and off-duty activities. Both of them gave unfavorable references to a major air carrier with whom the captain had filed an employment application. These previous employers were not contacted by Princeville Airways prior to the captain's employment as a ramp agent or his selection as a first officer.

The evidence indicates that the captain's behavioral traits adversely influenced the captain's professional judgment on the day of the accident and

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[4] San Juan Air Lines, Inc. flight 204, Beechcraft B-99A, N803BA, October 4, 1988.

were factors that contributed to his decision to continue the planned VFR flight into IMC.

The investigation disclosed that because VFR weather conditions are predominant in the Hawaiian Islands, 14 CFR Part 135 IFR operations are relatively uncommon. Thus, some pilots, although qualified, rarely file IFR and are therefore unpracticed and may be reluctant to operate under IFR. The Safety Board believes that the combination of typically favorable weather conditions and Aloha IslandAir's VFR-oriented operation provided insufficient opportunity for pilots to maintain instrument flying skills.

Aloha IslandAir management apparently recognized that some of its pilots were weak on IFR skills and therefore had issued an operational requirement for pilots to log six instrument approaches per month. The Safety Board believes that this requirement was of little value because most of these approaches were flown in visual meteorological conditions, during revenue operations. Since significant visual cues are provided to pilots by peripheral vision, they cannot fully develop instrument flying skills in this manner. Additionally, this requirement did not give pilots the experience of filing an IFR flight plan while in flight or the knowledge gained by operating in the IFR system.

The Safety Board previously addressed the issue of vision-restricting devices in its investigation of three commuter accidents.[5] Safety Recommendation A-86-102, issued to the FAA on October 9, 1986, recommended that the FAA:

> Issue an Air Carrier Operations Bulletin Part 135, to verify that commuter air carrier operators use appropriate vision-restricting devices for their pilots during initial and recurrent flight instrument training.

In its response of September 15, 1987, the FAA stated that it had issued ACOB No. 87-4 which addressed the use of view-limiting devices during initial and recurrent training. The Safety Board found that the FAA's reply complied with the intent of the recommendation and classified Safety Recommendation A-86-102 as "Closed--Acceptable Action," on November 27, 1987.

The Safety Board believes that the accident involving flight 1712 dramatically indicates how quickly instrument flying skills and procedures can deteriorate when not used regularly.

The Safety Board finds that these considerations influenced the daily operational decisionmaking processes of Aloha IslandAir pilots, including those of this captain, to the detriment of flight safety. The Safety Board believes that 14 CFR Part 135 should require appropriate IFR recurrent training, using vision-restricting devices.

The investigation disclosed that the company placed little emphasis on crew coordination or CRM in its training. Although Aloha IslandAir believed that it

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[5] Op. cit.

addressed some elements of CRM in training, only the procedural mechanisms of crew interaction were addressed. The behavioral aspects of crew interaction were not discussed, and the investigation disclosed little awareness or understanding of the principles of CRM at Aloha IslandAir. The Safety Board notes that Aloha IslandAir has recognized this deficiency and has adopted the formal CFR program used by Aloha Airlines.

In summary, the Safety Board concludes that Aloha IslandAir management provided inadequate supervision of its personnel, training, and flight operations. The numerous deficiencies evident during the investigation relative to the IFR training of the pilots, the reduced ground school training, the lack of CRM training, the captain's known behavioral traits, and the policy of not using the weather radar systems installed on the airplanes, were the responsibility of the airline's management to correct. The failure of the management personnel to correct these deficiencies contributed to the events that led to this accident.

The investigation noted that N707PU was not equipped, nor was it required to be equipped, with a ground proximity warning system (GPWS). However, the possible benefit of a GPWS aboard flight 1712 was considered. Calculations show that a GPWS designed for commuter aircraft, such as the Twin-Otter would have given the warning "TOO LOW - TERRAIN" about 0.7 seconds after the airplane crossed the coastline or about 7 seconds prior to impact. Assuming a 3-second pilot recognition and response time to this warning, a wings-level pull up with a 1.5 G load factor would have allowed the flight to clear the terrain vertically.

As a result of the Safety Board's investigation of three commuter accidents[6] in 1985 and 1986, Safety Recommendation A-86-109 was issued to the FAA on October 9, 1986. This recommendation stated:

> Amend 14 CFR 135.153 to require after a specified date the installation and use of ground proximity warning devices in all multiengined, turbine-powered fixed wing airplanes, certificated to carry 10 or more passengers.

On April 24, 1990, the FAA issued a Notice of Proposed Rulemaking (Notice No. 90-14) to require the installation of GPWS in turbine-powered airplanes having 10 or more passenger seats. The comment period ended on July 23, 1990. The Safety Board had previously classified Safety Recommendation A-86-109 as "Open--Acceptable Action," pending the adoption of the final rule. Nevertheless, the Safety Board now reiterates this recommendation and encourages the FAA to expedite its rulemaking action.

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[6]Bar Harbor Airlines flight 1808, Beechcraft B-99, N30WP, Auburn-Lewiston Airport, Aurbourn, Main, August 25, 1985 (NTSB/AAR-86-06); Henson Airlines flight 1517, Beechcraft B-99, N339HA, Shenandoah Valley Airport, Grottoes, Virginia, September 23, 1985 (NTSB/AAR-86-07); Simmons Airlines flight 1746, Embraer EMB-110p1, Phelps Collins Airport, Alpena, Michigan, March 13, 1986 (NTSB/AAR-87-02)

The Safety Board believes that if the flightcrew had elected to remain on its assigned ATC frequency and had continued the VFR radar traffic advisory service, the controller would have been alerted by the Minimum Safe Altitude Warning (MSAW) system that the flight was approaching an unsafe terrain situation. A controller's observance of such a situation would have required the issuance of a safety alert to the flight regarding its situation.

A review of the FAA radar data indicated that except for a brief period near midpoint in the flight, radar contact with the flight was maintained until just before the airplane struck the terrain. This finding is supported by the fact that the airplane collided with terrain approximately 8 seconds after the last recorded return or about 4 seconds before the next sweep of the antenna would have illuminated the target. Therefore, even at the low altitude of flight 1712, ground-based radar controllers would have been able to warn the crew of its position relative to the coastline of Molokai if the crew had been in radio communication with ATC facilities.

The Safety Board investigated two other fatal accidents that have occurred involving Part 135 operators in the area of the Hawaiian Islands[7] in which radar services could have prevented such accidents or could have expedited search and rescue (SAR) efforts. The pilots of all of the airplanes, including flight 1712, had requested and had received VFR radar traffic advisory service for the initial portion of their intended flights.

One case was similar to flight 1712 because the airplane was tracked to within several hundred feet of impact. In the other case, the crash site was located about 2.5 nautical miles from the flight's last known radar position.

In all three accidents, SAR efforts were hampered and/or delayed because the exact location of the accident and the time the accident occurred were unknown. Additionally, in all three cases, the operator's flight-following system was unable to locate when or where their respective airplanes crashed.

The Safety Board believes that if pilots of the accident aircraft had utilized radar flight-following services or filed IFR, the accidents involving collision with rising terrain could have been averted. In the accident involving the aircraft lost at sea, the availability of such a service would have provided instantaneous notification of the situation, either by the simultaneous loss of radio and radar contact or by a distress call from the pilot. In either situation, the ATC system would have provided the means to activate SAR assets immediately and could have led to the recovery of survivors.

The Safety Board believes that the establishment of such radar flight-following services in the Hawaiian Islands should incorporate the use of FAA and US military ground-based radar facilities currently available in the Hawaiian Islands. Incorporation of these facilities would provide the maximum level of terrain-warning protection for the user. In the event of an in-flight emergency, SAR assistance could be activated immediately and a response could be made at a

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[7] Panorama Air Tours, Piper Pa-31-350, December 23, 1987; Scenic Air Tours Beechcraft BE-H18, June 11, 1989.

level not currently available to aircraft operating without benefit of contact with an ATC facility.

The investigation revealed that the collision with terrain might have been avoided if the airplane had been equipped with GPWS. The Safety Board supports the FAA's NPRM, Notice No. 90-14, which would require the installation of GPWS in all turbine-powered airplanes that have 10 or more passenger seats.

The investigation revealed that Aloha IslandAir was unaware that its experience with the captain's behavior was similar to that observed by the captain's two previous employers. The captain was originally hired as a ramp agent by Princeville Airways. Copies of his application for employment and background check could not be found in the company's files. Aloha IslandAir had not conducted a pre-employment background check on the captain before employing him as a first officer because he had previously worked for the company as a ramp agent for Princeville. Moreover, Aloha IslandAir had not examined the captain's safety record by using the FAA's accident/incident files and enforcement history records. If Aloha IslandAir had done so, it might have been able to identify and correct a pattern of inappropriate behavior before upgrading him to captain or it might have decided against upgrading him to captain.

The Safety Board believes that Aloha IslandAir should have conducted a background investigation of the captain's flying experience and FAA records prior to hiring him as a first officer.

The Safety Board addressed pre-employment screening of pilots following the investigation of the crash of Continental Airlines Flight 1713 at Denver, Colorado, on November 11, 1987.[8] As a result of that investigation, the Safety Board recommended that the FAA:

> *Require commercial operators to conduct substantive background checks* of pilot applicants, which include verification of personal flight records, and examination of training, performance, and disciplinary records of previous employers and Federal Aviation Administration safety and enforcement records. (Class II, Priority Action) (A-88-141)

The FAA agreed with the intent of the recommendation but did not believe that the benefits derived from such a regulatory change would outweigh the costs of promulgating and enforcing it. Therefore, the FAA placed the scope and standards for such screening entirely upon voluntary efforts of the operators. The Safety Board believes that the FAA's response to the recommendation is unacceptable and that the circumstances of the accident involving flight 1712 clearly emphasize the need for such a requirement. Therefore, the Safety Board now classifies Safety Recommendation A-88-141 as "Closed--Unacceptable Action/Superceded."

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[8] Aircraft Accident Report--"Continental Air Lines, Inc., Flight 1713, McDonnell Douglas DC9-14, N626TX, Stapleton International Airport, Denver, Colorado. November 15, 1987 (NTSB/AAR-88-09)

The Safety Board is concerned that its investigation and the FAA's special inspection of Aloha IslandAir found discrepancies that the POI did not detect during the base inspection or during other surveillance activities. Most of the discrepancies involved errors in training records, load manifests, and flight time logs. In other investigations, the Safety Board has noted that special inspections have revealed similar paperwork errors that were not detected through routine surveillance. The Safety Board recognizes that a special inspection involves many inspectors conducting comprehensive review of specific activities of an airline. Therefore, it is possible to discover problems that could have been overlooked by the POI during a base inspection.

However, three of the discrepancies found by the special inspection team indicate that the surveillance of Aloha IslandAir was seriously deficient. These discrepancies are: (1) initial ground-school training hours were reduced without the POI's knowledge, (2) records for two of the airline's check airmen, one of which was the chief pilot, did not contain evidence that they received check-airman training required by 14 CFR Section 135.339, and (3) scheduled flight times rather than actual flight times were being recorded by both the airline and the pilots. The Safety Board is concerned that the POI did not monitor how Aloha IslandAir pilots maintained their instrument proficiency or how instrument training was accomplished.

The Safety Board realizes that the abbreviation of the ground school syllabus occurred after the base inspection and that it would be incumbent upon the operator to request from the POI such a change to its operations specifications. However, the POI did not monitor the training times for first officers and discover this reduction in their training, indicating an unacceptable level of surveillance.

The Safety Board believes that the inadequate surveillance is a result of the POI's heavy workload and insufficient qualitative guidance from FAA headquarters. Interviews with the POI and the FSDO manager indicate that turnover of personnel and the lack of experienced personnel resulted in only two POIs having responsibility for all the general aviation and Part 135 surveillance activities for FSDO-13 from June until August 1989. In August, one of the two POIs was reassigned to surveil 14 CFR Part 121 operators.

The Safety Board believes that it was possible for 52 operators to be surveilled by only one or two persons because the requirements of the FAA's National Program are too low. One yearly base inspection, six ramp inspections, and six en route inspections do not provide a reasonable level of surveillance of a rapidly growing airline that has considerable turnover in pilots, of which many have less than 400 hours total flight time. The unauthorized reduction in first officer ground training hours and the lack of instrument proficiency by some Aloha IslandAir pilots was allowed to continue because of insufficient staffing at FSDO-13 and inadequate inspection requirements.

The Safety Board believes that at least three accidents in the Hawaiian Islands might have been prevented if FSDO-13 had personnel and guidance to maintain adequate surveillance of its assigned 14 CFR PART 135 operators. Although the geographic area under the jurisdiction of FSDO-13 was reduced on January 1, 1990, the Safety Board is concerned that it may still have

insufficient numbers of experienced personnel to accomplish its mission. Additionally, the Safety Board is concerned that a similar situation may exist at other FSDOs. Therefore, the Safety Board believes that the FAA should perform a special study of the adequacy of staffing of POIs relative to their workloads, available time, size, and complexity of the operators under their supervision, and the geographical area of surveillance responsibility.

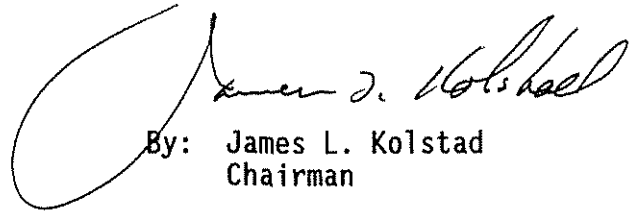
Therefore, as a result of this accident, the National Transportation Safety Board recommends that the National Weather Service:

> Require that weather forecasts note the possible formation of orographic clouds and precipitation when conditions exist that would create such clouds. (Class II, Priority Action) (A-90-142)

Also, the Safety Board issued Safety Recommendations A-90-135 through -141 to the Federal Aviation Administration; A-90-143 through -144 to Aloha IslandAir; and A-90-145 to the Regional Airline Association and the Aircraft Owners and Pilots Association.

The National Transportation Safety Board is an independent federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation A-90-142 in your reply.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, LAUBER, BURNETT, and HART, Members, concurred in this recommendation.



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