NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

July 20, 2020

Factual Report

OPERATIONAL FACTORS

WPR19MA177

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A. ACCIDENT

Location:	Mokuleia, HI (Dillingham Airfield)
Date:	June 21, 2019
Operator:	Oahu Parachute Center
Time:	1822 HST[1]
Registration:	N256TA

B. SUMMARY

On June 21, 2019, at 1822 Hawaii-Aleutian standard time, a Beech 65-A90, N256TA, collided with terrain after takeoff from Dillingham Airfield (HDH), Mokuleia, Hawaii. The commercial pilot and ten passengers sustained fatal injuries, and the airplane was destroyed. The airplane was owned by N80896 LLC and was being operated by Oahu Parachute Center (OPC) under the provisions of Title 14 *Code of Federal Regulations (CFR)* Part 91 as a local sky-diving flight.[2] Visual meteorological conditions prevailed, and no flight plan had been filed.

C. OPERATIONAL FACTORS GROUP

David Lawrence – Group Chairman
Senior Aviation Safety Investigator
National Transportation Safety Board
Washington, DC

Scott Allen
Aviation Safety Inspector (ASI)
Federal Aviation Administration (FAA)
Honolulu Flight Standards District Office

D. DETAILS OF THE INVESTIGATION

On June 22, 2019, the NTSB Operational Factors Group (Ops Group) Chairman was launched to Honolulu, HI.

On June 23, 2019, the Ops Group Chairman participated in an in-brief with the NTSB Investigator in Charge (IIC) and the investigation organizational meeting. An on-scene examination of the accident site was conducted, and personal effects from the accident pilot's car were collected, reviewed and provided to the Honolulu Police Department (HPD) for transfer to the local medical examiner's office.[3] Information and documentation was obtained from the local airport fueler. FAA certification information for the accident pilot and aircraft was requested from the FAA, along with Air Traffic Control (ATC) communications and radar information. Manufacturer documentation and manuals were requested, and witness photos were obtained. A visual review of the runway was conducted with no aircraft debris noted. Oahu Parachute Center (OPC) owner and office manager were interviewed, and company documentation was obtained. Federal Bureau

[1] All times Hawaii Standard Time (HST) unless otherwise noted.
[2] The operation of the flight was also required to comply with the provisions of 14 *CFR* Part 105 Parachute Operations.
[3] The accident pilot's FAA pilot license and Hawaii driver's license (expiration of January 9, 2021) were found in the accident pilot's car located at the Oahu Parachute Center parking lot.

of Investigation (FBI) and National Driver Register (NDR) background checks for the accident pilot were initiated.

On June 24, 2019, received aircraft logbooks from Oahu Parachute Center contract mechanic, and delivered to the NTSB Structures Group Chairman. Fuel documentation and fuel samples from fueling truck located at HDH were requested. Obtained security camera footage from Skydive Hawaii (located next to Oahu Parachute Center at HDH) showing final accident sequence, and interviewed multiple Oahu Parachute Center employees and witnesses. Retrieved ATC data of accident airplane's flights for June 21, 2019.

On June 25, 2019, added an FAA member to the Ops Group and in-briefed him on investigation and work plan. Conducted an on-scene visit to the accident site. Obtained GoPro footage from three (3) previous Oahu Parachute Center jump flights on the day of the accident. Reviewed witness emails and photos. Interviewed jumpers from the flight just prior to the accident flight. Conducted additional witness interviews.

On June 26, 2019, conducted additional witness interviews and obtained additional witness photos. Spoke with accident pilot's brother and obtained the pilot's logbooks and resume. Conducted interviews of a former Oahu Parachute Center King Air pilot, and accident airplane's ferry pilot and test pilot.

On June 27, 2019, interviewed accident pilot's roommate and began working on field notes.

On June 28, 2019, NTSB emails were sent to additional witnesses requesting statements and documentation, and the Group field notes were completed. The on-scene portion of the investigation was concluded on June 28, 2019.

Between July 5 , 2019 and August 19, 2019 attempted to contact accident pilot's flight instructor via multiple emails and phone calls.

Between July 2019 and November 2019 additional documentation from Textron and the FAA was received.

On August 28, 2019, the Ops Group Chairman participated in an Airworthiness Group Chairman's interview of the accident airplane's owner.

On October 29, 2019 the Group interviewed a former FAA Aviation Safety Inspector (ASI).

On November 5, 2019 the Group obtained statements from witnesses on the flight previous to the accident flight.

On January 16, 2020 the Ops Group Chairman and IIC attempted to interview the accident pilot's former flight instructor in Torrance, California pursuant to a subpoena (NTSB Subpoena

#3.43809.75234).[4] The instructor did not appear for the interview.[5] Ops Group Chairman and IIC visited N715GC (C90 King Air used in training for the accident pilot) at Ross Aviation at Long Beach Airport - Daugherty Field (LGB) in Long Beach, California and visually verified dual yolk installation on that aircraft.[6]

E. FACTUAL INFORMATION

1.0 History of Flight

The accident flight on June 21, 2019 was a 14 *CFR* Part 105 parachute operation conducted under 14 *CFR* Part 91 operating rules.[7] It was the fourth of five scheduled flights that day for Oahu Parachute Center at Dillingham Airfield, Mokuleia, Hawaii. There were two (2) morning flights that were conducted that day,[8] and three (3) scheduled afternoon flights that were designated "sunset fights."[9] The accident occurred on the second "sunset flight" of the day. The accident pilot was the pilot in command (PIC) for all of the Oahu Parachute Center flights on June 21, 2019.

The accident flight had three passenger parachutists,[10] three Oahu Parachute Center tandem parachute instructors,[11] two Oahu Parachute Center parachutists[12] performing the functions as

[4] See Attachment 5 - NTSB Letter and Subpoena to Pilot's Instructor.
[5] According to the NTSB General Counsel's office, the subpoena was subsequently referred to the U.S. Attorney's office in California.
[6] According to Ross Aviation ramp personnel, N715GC was being used for "King Air First Officer" training by the accident pilot's instructor. The verification at LGB was performed by visual examination through the airplane's side windows.
[7] According to 14 *CFR* 105.3, Parachute operation means the performance of all activity for the purpose of, or in support of, a parachute jump or a parachute drop. This parachute operation can involve, but is not limited to, the following persons: parachutist, parachutist in command and passenger in tandem parachute operations, drop zone or owner or operator, jump master, certificated parachute rigger, or pilot.
[8] According to available radar data, the first flight of the day possibly departed about 0820 HST and the second flight possibly departed about 0930 HST. According to onboard video, both morning flights departed runway 26 at HDH. For additional information on the available radar data, see Section 7.1 Radar Plots of this Factual Report.
[9] According to available radar data, the first afternoon "sunset" flight (the flight prior to the accident flight) possibly departed about 1725 HST. For additional information on the available radar data, see Section 7.1 Radar Plots of this Factual Report. According to an employee of Skydive Hawaii, Pacific and Skydive Hawaii (two other parachute operations located at HDH) were not taking "loads" (parachute flights) since the weather around noon was observed poor skydive weather with winds from the south which can also produce mountain rotors. He said the winds were south at about 5-10 mph with "tons" of clouds. They were landing on runway 08, and he saw layers of clouds with tops at about 7,500 feet. See Attachment 2 – Records of Conversation.
[10] According to 14 *CFR* 105.3, Passenger parachutist means a person who boards an aircraft, acting as other than the parachutist in command of a tandem parachute operation, with the intent of exiting the aircraft while in-flight using the forward harness of a dual harness tandem parachute system to descend to the surface. Tandem parachute system means the combination of a main parachute, approved reserve parachute, and approved harness and dual parachute container, and a separate approved forward harness for a passenger parachutist.
[11] According to 14 *CFR* 105.3, Tandem parachute operation means a parachute operation in which more than one person simultaneously uses the same tandem parachute system while descending to the surface from an aircraft in flight.
[12] According to 14 *CFR* 105.3, Parachutist means a person who intends to exit an aircraft while in flight using a single-harness, dual parachute system to descend to the surface.

cameramen, two parachutists commonly referred to as "fun jumpers"[13] who were late additions to the accident flight, and the pilot.[14] The two late arriving "fun jumpers" had been on the previous flight to the accident flight. According to witnesses, as the airplane began to taxi out on the accident flight, the last two jumpers (who were originally scheduled for the last sunset flight) rushed back out to the airplane following their previous jump and boarded.

After the last two jumpers were loaded onto the airplane, the pilot then taxied to runway 08 at HDH about 1820. About 1822, the aircraft departed runway 08. According to multiple witnesses and security camera footage, on takeoff the airplane banked to the left after it became airborne, rolled inverted, then descended into the ground.[15]

Photo 1: Enlarged screen-shot image from security camera footage showing N256TA inverted, nose down and in a left bank just prior to impact (indicated by red arrow).[16]

The aircraft impacted a grass and dirt area to the north of the runway approximately 630 feet northeast of the departure end of runway 08 in a nose-down, left-wing-low inverted attitude. The

[13] "Fun jumper" was a common term used for a single parachutist who was not an employee of the parachute operation and paid for a ride on the airplane with the intent of conducting a parachute jump.

[14] One of the Oahu Parachute Center tandem instructors held a 14 *CFR* Part 65 senior parachute rigger certificate (he also held a student pilot certificate). One other Oahu Parachute Center tandem instructor held a student pilot certificate. A search of the Accident/Incident Data System (AIDS) and the Enforcement Information System (EIS) revealed no records pertaining either of these pilots. Title 14 *CFR* 65.111 stated, in part: *No person may pack, maintain, or alter any personnel-carrying parachute intended for emergency use in connection with civil aircraft of the United States (including the reserve parachute of a dual parachute system to be used for intentional parachute jumping) unless that person holds an appropriate current certificate and type rating issued under this subpart and complies with §§ 65.127 through 65.133.*

[15] According to the FAA, a loss-of-control (LOC) accident involves an unintended departure of an aircraft from controlled flight. LOC can happen when the aircraft enters a flight regime that is outside its normal flight envelope and quickly develops into a stall or spin. It can introduce an element of surprise for the pilot.

[16] Source: Skydive Hawaii security camera, channel 4, captured about 1822.

impact angle was estimated to be approximately 42º. The aircraft came to rest inverted next to the airport perimeter fence. A large area of grass located east of the wreckage, inside the airport perimeter fence and north of the wreckage, between the airport perimeter fence and the highway adjacent to the airport, was burned.[17] All eleven (11) occupants of the aircraft were fatally injured.

2.0 Pilot Information

The pilot was 42 years old and resided in Haleiwa, HI.[18] He was a French national (English proficient), and held a Commercial Pilot certificate dated December 13, 2017 with airplane multiengine, instrument airplane, private privileges airplane single-engine land ratings and English proficient. According to Oahu Parachute Center records, he began flying for Oahu Parachute Center on March 9, 2019.[19]

According to the pilot's brother, he previously did aerial photography flying for Eagle View Aerial in California. According to his resume, the pilot was previously employed as a PA23-250T survey pilot for JAV Imagery, LLC in St. George, Utah, conducting Part 91 aerial survey for "real estate and compliance purposes" from March 2018 to February 2019.[20] Prior to that he listed on his resume that he was a "First Officer" on a King Air C90GTx for Riter Aviation in Torrance, CA conducting Part 91 operations from April 2017 to March 2018.[21]

According to the pilot's roommate, he did not drink, smoke or do drugs, and led a very clean lifestyle. To her knowledge, he did not have any financial difficulties, and he had previously been an investment banker in London, and always paid his rent on time. She stated that he was always in bed by 2100-2130, and typically woke up at 0700 and went to work about 0730. He did not work on Tuesdays.

A review of the FAA Program Tracking and Reporting Subsystem (PTRS),[22] the Accident/Incident Data System (AIDS) and the Enforcement Information System (EIS) found no records associated with the accident pilot.

2.1 The Pilot's Certification Record[23]

Student Pilot (carrying passengers prohibited) certificate issued May 8, 2017.

[17] See Systems and Structures Group Chairman's factual report.
[18] The pilot's FAA certification records indicated a residence of Yucaipa, CA.
[19] See Attachment 4 – Pilot OPC Training Records.
[20] See Attachment 3 – Pilot Information.
[21] According to the Textron Type-Certificate Data Sheet (NO. EASA.IM.A.503, issue 8) dated December 20, 2018 for the C90GTx (King Air), the minimum flight crew for the King Air was one pilot.
[22] The Program Tracking and Reporting Subsystem (PTRS) is a comprehensive information management and analysis system used in many Flight Standards Service (AFS) job functions. It provides the means for the collection, storage, retrieval, and analysis of data resulting from the many different job functions performed by Aviation Safety Inspectors (ASIs) in the field, the regions, and headquarters. This system provides FAA managers and inspectors with the current data on airmen, air agencies, air operators, and many other facets of the air transportation system. Source: FAA.
[23] Source: FAA.

Notice of Disapproval – Private Pilot – Airplane Single Engine Land issued July 9, 2017. Areas of reexamination: Takeoffs, Landings, Go Arounds.

Private Pilot – Airplane Single Engine Land certificate issued July 22, 2017.

Notice of Disapproval – Private Pilot – Instrument Airplane issued October 26, 2017. Areas of reexamination: Instrument Approach Procedures.

Private Pilot – Airplane Single Engine Land, Instrument Airplane certificate issued November 13, 2017.

Notice of Disapproval – Commercial Pilot – Airplane Multiengine Land issued December 2, 2017. Areas of reexamination: Takeoffs, Landings, Go Around; Performance and Ground Reference Maneuvers; Multiengine Operations.

Commercial Pilot –Airplane Multiengine Land, Instrument Airplane, Private Privileges Airplane Single Engine Land certificate issued December 13, 2017.[24]

2.2 Certificates and Ratings Held at Time of the Accident[25]

Commercial Pilot (certificate issued December 13, 2017)
Airplane Multiengine Land, Instrument Airplane; Private Privileges Airplane Single Engine Land, English Proficient

Medical Certificate - Second Class (issued November 1, 2018)
Limitations: None

2.3 Pilot Flight Times

According to his most recent FAA Form 8500-8 (dated October 31, 2018),[26] the accident pilot reported he had 750 total hours to date and 232 hours in the past 6 months.

According to an insurance form completed by the pilot when employed by Oahu Parachute Center in March 8, 2019, he had 872 total hours flying experience, with 771 hours listed as pilot-in-command (PIC), and 101 hours as co-pilot. Of that time, he listed 1.7 hours as PIC turbo-prop single engine, 396 hours multiengine piston PIC, and 27 hours multiengine turbine time. He also stated on the form that he had flown 435 hours in the last 12 months, and 68 hours in the last 90 days.

[24] The pilot's December 13, 2017 Commercial Airplane Multiengine practical examination met the 14 *CFR* 61.56(d)(1) requirement for a flight review to act as PIC within the previous 24 calendar months at the time of the accident.
[25] According to FAA Advisory Circular (AC) 105-2E Sport Parachuting, the PIC is responsible for meeting the certification, proficiency, operating, and experience requirements of, but not limited to, 14 *CFR* 61, 91, and 105. Pilots conducing flight operations for compensation or hire are required to possess a Commercial Pilot Certificate with appropriate ratings for aircraft being flown and must have a current Class 2 medical certificate or equivalent.
[26] FAA Form 8500-8 Application for Airman Medical Certificate or Airman Medical & Student Pilot Certificate.

A review of the pilot's logbooks indicated that as of his last recorded logbook entry on March 21, 2019, he had logged 897.7 hours total flight time and 83.5 hours turbine time.

The NTSB estimated the accident pilot's flight times as follows:[27]

Total pilot flying time	1,086.3
Total Pilot-In-Command (PIC) time	985.3
Total King Air PIC (OPC)	213.9[28]
Total Multiengine time	696.1
Total Turbine time	272.1
Total flying time last 30 days	59.8
Total flying time last 90 days	179.4
Total flying time last 12 months	495.6

NTSB investigators reviewed all logged flight time in the accident pilot's logbook and noted the following:[29]

- On April 22, 2017, he began flying a PA-28 as a student pilot
- Between May 2, 2017 and July 11, 2017, he logged a total of 43 hours King Air flight time, including: [30]

    - On May 2, 2017, he logged 7.8 hours PIC time in a King Air (with 8 takeoffs and landings on a "commercial long X-C" flight) with a note "FAR 61.129(b)(4)(i) and (ii)," while still a student pilot (this entry was not signed off by an instructor).[31]

[27] Between March 9, 2019 and March 21, 2019, the pilot averaged 2.3 hours per available day of flight (excludes Tuesdays) while flying as PIC for Oahu Parachute Center on the accident airplane. There were 82 available days of flight at Oahu Parachute Center since the last logged entry (March 21, 2019) and the date of the accident for an estimate of 188.6 hours total hours flown that were not logged in the pilot's logbook.

[28] According to interviews, a typical load (single jump flight) took involved a 15 minute climb to jump-run altitude of 14,000 with a total flight time for the flight (load) lasting about 30 minutes. Title 14 *CFR* 91.211 prohibited flights with cabin pressure altitudes above 14,000 feet (MSL) unless the required minimum flight crew is provided with and uses supplemental oxygen during the entire flight time at those altitudes

[29] See Attachment 6 – Pilot Logbook.

[30] According to FAA records, the C90 King Air (N715GC) that was logged in the accident pilot's logbook between April 22, 2017 and November 22, 2017 and prior to being hired by Oahu Parachute Center was owned by BB&T Equipment Finance Corporation in Yucaipa, California and operated under Part 91 for Giumarra Bros. Fruit Co. Inc. During the period of May 12, 2017 and November 22, 2017 Giumarra Bros. subcontracted all pilot services to Riter Aviation in Torrance, CA. Riter Aviation was owned by the accident pilot's flight instructor. Giumarra Bros stated that the flight instructor was "the pilot in command of the King Air 100% of the time" and had "complete authority over the aircraft." Source: Email sent to the NTSB July 11, 2019 3:29:26 PM from Giumarra Bros. Fruit Co.

[31] "FAR" refers to the Federal Aviation Regulations, and is synonymous with CFR. Title 14 *CFR* 61.129 covered the operating experience required for a Commercial Pilot certificate. Title 14 *CFR* 61.129(b)(4)(i) specifically required [for an airplane multiengine rating] one cross-country flight of not less than 300 nautical miles total distance with landings at a minimum of three points, one of which is a straight-line distance of at least 250 nautical miles from the original departure point. Title 14 *CFR* 61.129(b)(4)(ii) specifically required [for an airplane multiengine rating] 5 hours in night VFR conditions with 10 takeoffs and 10 landings (with each landing involving a flight with a traffic pattern) at an airport with an operating control tower.

    - On May 11, 2017 and May 12, 2017, he logged a total of 5.7 hours in a King Air, signed off by an instructor from Riter Aviation.[32]
    - On May 17, 2017 and May 18, 2017, he logged 8.2 total hours "dual cross-country FAR 61.129(b)(4)(ii)" PIC time in a King Air while still a student pilot, signed off by the same instructor from Riter Aviation.
    - On May 25, 2017, he logged 4.5 hours as "dual cross-country, First Officer Training" in a King Air while still a student pilot, signed off by the same instructor from Riter Aviation.
    - On June 22, 2017, he logged 6.3 hours in a King Air as "First Officer Training, Border Crossing" while still a student pilot, signed off by the same instructor from Riter Aviation.
    - On June 23, 2017, he logged 6.1 hours in a King Air "61.129(b)(4)(i) ME Commercial Long X/C" PIC time while still a student pilot.
    - On July 11, 2017, he logged 4.4 hours "First Officer Training X-country" while still a student pilot, signed off by the same instructor from Riter Aviation.
- On July 9, 2017, he failed his Private Pilot practical examination.
- On July 22, 2017 he passed his Private Pilot practical examination.
- Between October 9, 2017 and November 22, 2017, he logged 9.5 total hours King Air flight time, including:
    - On October 9, 2017, he logged 0.4 hours "King Air" time, signed off by the same instructor from Riter Aviation.
    - On November 20, 2017 and November 22, 2017, he logged 9.1 total hours as "FAR 61.127(b)(2)" in a King Air, signed off by the same instructor from Riter Aviation.[33]
- On October 26, 2017, he failed his Instrument Rating practical examination.
- On November 13, 2017, he passed his Instrument Rating practical examination.
- On December 2, 2017, he failed his Commercial Pilot practical examination.
- On December 13, 2017 he passed his Commercial Pilot practical examination.
- Between January 21, 2019 and March 21, 2019, he logged a total of 29.3 hours King Air PIC time, including:
    - On January 21, 2019, he logged 2.0 hours (with 5 takeoffs and landings) "Jump Pilot Training" in a King Air (no instructor sign-off)

[32] All of the accident pilot's instructor sign-offs and endorsements came from the same certificated flight instructor (CFI), who was the owner of Riter Aviation. Based on various internet searches, Riter Aviation was a Part 91 flight school located at Zamperini Field Airport (TOA) in Torrance, California. According to the airport management office at TOA, Riter Aviation left TOA and moved the C90 King Air to LGB. According to Ross Aviation at LGB, the C90 King had been hangared at LGB since January 2019.

[33] Title 14 *CFR* 61.127 covered the flight proficiency requirements for a Commercial Pilot certificate. Title 14 *CFR* 61.127(b)(2) specifically required flight instruction [airplane category rating with a multiengine class rating] in the following areas: (i) Preflight preparation; (ii) Preflight procedures; (iii) Airport and seaplane base operations; (iv) Takeoffs, landings, and go-arounds; (v) Performance maneuvers; (vi) Navigation; (vii) Slow flight and stalls; (viii) Emergency operations; (ix) Multiengine operations; (x) High-altitude operations; and (xi) Postflight procedures.

- His final logbook entry was March 21, 2019. [34]

FAA records indicated that the accident pilot's flight instructor signed off the FAA Form 8710-1 for each of the accident pilot's certificate rides that resulted in a Notice of Disapproval. According to FAA records, in the 2 years prior to April 10, 2020, 59% of all students the instructor endorsed passed their certificate or rating practical examination on the first attempt.[35]

According to FAA statistics, for pass/fail activity data nationally for applications processed by the FAA Airman Certification branch (for private, commercial and ATP certificates and/or an added rating) with a certified flight instructor (CFI) recommendation, in 2017 was an overall 79.8% pass/fail rate (51,990 total pass, 13,130 total fail). In 2018 the overall pass/fail rate was 79.8% (57,889 total pass, 14,644 total fail). In 2019 the overall pass/fail rate was 80.4% (45,328 total pass, 15,774 total fail). The total pass/fail rate for CFI recommended private, commercial, and ATP certificates (no additional rating) was 75.7% in 2017 (26,953 total pass, 8,655 total fail), 76.4% in 2018 (30,268 total pass, 9,334 total fail), and 77.3% in 2019 (35,083 total pass, 10,245 total fail).[36]

2.4 Oahu Parachute Center King Air Training

According to FAA Advisory Circular (AC) 105-2E Sport Parachuting, for those Drop Zone Operators (DZOs) and parachuting operations that do not have a nationally recommended jump pilot training program, the FAA recommended that pilots flying aircraft for the purpose of sport parachuting have appropriate initial and recurrent training. The training program should include testing to ensure a high level of competence in the jump aircraft being flown. The AC also provides a list of suggested ground and flight training elements.[37]

According to the pilot's logbook and accident aircraft logs, the accident pilot received King Air training from another Oahu Parachute Center King Air pilot on March 9, 2019 and March 10, 2019.[38]

The pilot's logbook and company records for March 9, 2019 logged two "loads" (parachute flights), and the pilot also logged three "touch and go's" in his logbook for that date. Company records indicated "training" and two loads for March 9, 2019.

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[34] On December 13, 2019 the NTSB requested a legal determination of 14 *CFR* 61.129 with respect to a student pilot (without a minimum of a Private Pilot certificate or multiengine rating) logging and crediting, and a certified flight instructor endorsing, commercial cross-country flight instruction in a multiengine turbine powered airplane (Request 20-069). See Attachment 24 - FAA Legal Interpretations.

[35] Source: FAA email to the NTSB dated April 13, 2020 in response to NTSB request 20-088.

[36] Source: FAA email to the NTSB dated June 22, 2020 in response to NTSB request 20-149. For CFI certification renewal requirements, see 14 *CFR* 61.197, which says in part that one means for an instructor to renew their CFI certificate every 24 calendar months is to have "endorsed at least 5 students for a practical test for a certificate or rating and at least 80 percent of those students passed that test on the first attempt."

[37] See Attachment 7 - Advisory Circular 105-2E.

[38] See Attachment 4 - Pilot's OPC Training Record. The accident pilot's Oahu Parachute Center instructor was fatally injured in a Cessna 305 accident (N65070) on February 22, 2020 at Dillingham Airfield. See NTSB case number ANC20FA024.

The pilot's logbook and aircraft log for March 10, 2019 logged four "loads" (parachute flights) and the pilot also logged four "loads" in his logbook for that date. Company records indicated "training" and four loads for March 10, 2019.

According to former Oahu Parachute Center pilots, there was no training curriculum for Oahu Parachute Center King Air pilots and no company training or procedures manuals. The Oahu Parachute Center pilot[39] who provided King Air training to multiple other Oahu Parachute Center King Air pilots (but did not train the accident pilot) said the company did not have any direction in training, and he was told to take new pilots and teach them how to start the engines, taxi and takeoff, fly the jump run then land a couple of times, and then they were good to go. He said there was no money to take the airplane off the line to just train pilots, and training consisted of doing "…a couple of jump runs, hand them the keys and that was it." There was no formalized training since there was no money to take the airplane out of service for training flights, and they primarily trained by viewing the King Air Academy videos on YouTube and not hands-on training.

Another former part-time Oahu Parachute Center King Air pilot stated that the training at Oahu Parachute Center "was a joke." He said his training was minimal, and when completed, his instructor hopped out of the airplane and told him "not to get uncoordinated." There were no procedures given to him to follow, and there was no training on how to fly the airplane. He said he "never signed any paperwork" at Oahu Parachute Center when he worked part-time for the company, never met the owner of the company, and quit flying for Oahu Parachute Center in November 2018.[40]

The Oahu Parachute Center pilot who provided training to the accident pilot in the King Air told NTSB investigators that he let the accident pilot sit in the right seat during their first flight, and they then did some air work to include steep turns, single engine work and a V_{MC}[41] demonstration. He considered the accident pilot "a good stick."[42]

The Oahu Parachute Center pilot who provided King Air training to the accident pilot's instructor said he really did not train the instructor since there was no money to take the airplane off the line to just train pilots. His training consisted of doing "…a couple of jump runs, hand them the keys and that was it." He further said the instructor "had a real hard time with the Beech" and Oahu Parachute Center did not use him often. He said the accident pilot's instructor seemed confused by the King Air and did not understand the flows, and he also had a hard time figuring out how to start the King Air engines.

[39] This Oahu Parachute Center King Air pilot did not hold a certificated flight instructor certificate.
[40] See Attachment 2 - Records of Conversation.
[41] According 14 *CFR* Part 1 Definitions, V_{MC} means minimum control speed with the critical engine inoperative. Critical engine means the engine whose failure would most adversely affect the performance or handling qualities of an aircraft.
[42] According to FAA records, the pilot who provided Oahu Parachute Center King Air instruction to the accident pilot held an Airline Transport Pilot (ATP) certificate (dated February 19, 2008) and 2nd Class Medical certificate (dated April 19, 2018), and a CFI certificate (dated September 21 2017) with airplane single and multiengine, glider, rotorcraft-helicopter, and instrument airplane ratings.

3.0 Medical Information

According to the accident pilot's most recent FAA Form 8500-8 (dated October 31, 2018), he indicated he had no history of drug/alcohol convictions and no history of nontraffic convictions. He disclosed that he had a previous Lasik surgery in 2012.

A muscle tissue specimen from the pilot that was sent by the local medical examiner to the FAA's Civil Aerospace Medical Institute (CAMI)[43] in Oklahoma City, Oklahoma, tested negative for ethanol and a variety of legal and illegal drugs.

4.0 Accident Airplane

Photo 2: Photo of accident airplane (N256TA).[44]

The accident airplane was a Beech Model 65-A90 King Air, serial number LJ-256. It was a fixed wing multiengine turbo-prop airplane manufactured in 1967. According to FAA records, it had an airworthiness certificate dated May 3, 2012.[45] It was powered by two Pratt and Whitney PT6A engines. According to the Beech Model 65-A90 FAA Flight Manual (revised August 31, 1997), the airplane was certified as a normal category aircraft,[46] and aerobatic maneuvers, including spins, were prohibited.[47]

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[43] The FAA Civil Aerospace Medical Institute (CAMI) is the medical certification, research, education, and occupational health wing of the FAA's Office of Aerospace Medicine.
[44] Source: Former Oahu Parachute Center King Air pilot. (date of photo June 17, 2017)
[45] See Attachment 8 - N256TA FAA Records.
[46] Reference 14 *CFR* Part 23 Airworthiness Standards: Normal Category Airplanes.
[47] Title 14 *CFR* 91.303 Aerobatic Flight stated the following, in part: *Aerobatic flight means an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.*

According to FAA records, the registered owner was N80896 LLC of Granite Bay, California.[48] The owner of N80896 LLC had a two-year lease with the owner of Oahu Parachute Center, commencing May 15, 2017.[49]

The airplane was configured for skydiving operations, and was equipped with two vinyl-covered longitudinal straddle-bench seats mounted about 6 inches inboard from the cabin walls.[50] The left bench extended from the back of the pilot's seat through to the forward edge of the cabin door opening. The right bench extended from the copilot's seat through to the aft edge of the cabin door opening.

The right bench had a capacity for seven jumpers, and the left bench for five.[51] The copilot's seat could be moved to face forward or backward.[52] When installed facing backwards, it was used to carry one jumper.[53]

Each passenger was restrained on the benches using a single lift-belt buckle harness, intended to be looped through the lower leg or horizontal back strap of their respective parachute harnesses.[54] The belts were tethered with floor fittings to the pre-existing seat rails on the outboard sides of the benches.

[48] Source: https://registry.faa.gov/aircraftinquiry/NNum_Results.aspx?NNumbertxt=256TA.
[49] See Attachment 9 - N256TA Lease and Insurance.
[50] See Attachment 10 – Beech A90 Door-removed Procedures.
[51] The airplane's owner stated that an additional jumper seatbelt had been installed on the left copilot seat rail to accommodate for a jumper seated over the wing spar on the floor area. The owner of Oahu Parachute Center stated that he had never seen this belt installed, and would have removed it if he had, as he did not want any jumpers sitting on the floor. See Attachment 1 – Interview Summaries.
[52] The copilot control yoke had been removed on the accident airplane.
[53] According to the accident airplane's owner and the owner of Oahu Parachute Center, the copilot seat was always occupied by a tandem instructor for weight and balance purposes.
[54] FAA AC 105-2E provided suggestions to improve sport parachuting safety, and includes specific reference to jumper tethering systems. The AC stated that in straddle-bench configurations, single point, single tether restraints were not very effective, and that for superior restraint, dual tethers should be installed, one on either side of each jumper. See Attachment 7 - Advisory Circular 105-2E and Restraint Factual Report in the docket for this investigation.

4.1 Dimensions

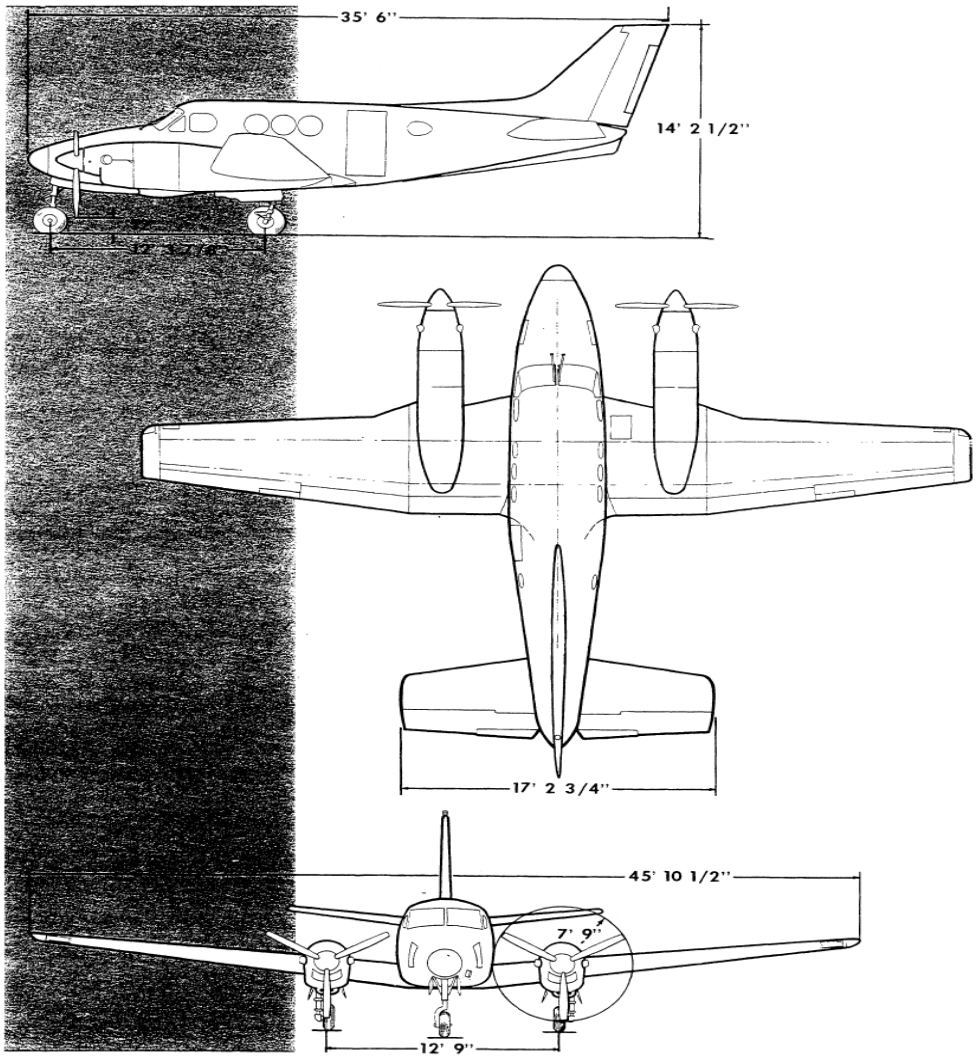

Figure 1: Beech A90 King Air dimensions.[55]

[55] Source: Beechcraft King Air A90 Pilot Operating Manual (revised February 9, 1977).

4.2 General Specifications[56]

GENERAL SPECIFICATIONS

WEIGHTS

Gross Weight	9300 lbs.
Maximum Landing Weight	8835 lbs.
Empty Weight (includes standard equipment)	5600 lbs.

WING AREA AND LOADING

Wing Area	279.7 sq. ft.
Wing Loading at gross weight	33.2 lbs./sq. ft.
Power Loading at gross weight	9.3 lbs./hp

DIMENSIONS

Wing Span	45 ft. 10 1/2 in.
Length	35 ft. 6 in.
Height to top of fin	14 ft. 2 1/2 in.

CABIN DIMENSIONS

Length	108 in.
Height	57 in.
Width	54 in.
Entrance Door	27 in. x 51 3/4 in.
Baggage Compartment Volume	26 cu. ft.
Electronics Compartment Volume	22 cu. ft.

FUEL AND OIL CAPACITY

Fuel Capacity in Nacelle Tanks	122 gallons
Fuel Capacity in Wing Tanks	262 gallons
Oil Capacity (each engine)	3.5 gallons

Figure 2: General King Air A90 specifications.[57]

4.3 King Air Operating Limitations

The King Air operating limitations were listed in the Beech Model 65-A90 FAA Flight Manual (revised August 31, 1997).

[56] Source: Beech Model 65-A90 FAA Flight Manual (revised August 31, 1997).
[57] Source: Beechcraft King Air A90 Pilot Operating Manual (dated May 27, 1966), page 1-3.

AIRSPEED LIMITS (CAS)

Maximum Operating Speed (Red Radial)	208 knots
Normal Operating Range (Green Arc)	93 knots to 208 knots
Full Flap Operating Range (White Arc)	75 knots to 130 knots
Maximum Flap Extension Speed:	
Approach Position - 35%	174 knots
Full Down Flap Position - 100%	130 knots
Maximum Gear Extended Speed	156 knots
Maximum Gear Operating Speed	
Extension	156 knots
Retract	130 knots
Maximum Design Maneuvering Speed	169 knots

ALTITUDE LIMITATION

30,000 feet

MANEUVERS

This is a normal category aircraft. Acrobatic maneuvers, including spins, are prohibited.

FLIGHT LOAD FACTORS

At design gross weight, 9300 lbs.; Maneuver - positive, 3.70 G, negative, 1.68 G.

NOTE

Use controls with caution above 169 knots CAS.

Figure 3: Beech Model 65-A90 airspeed limitations.[58]

On cockpit overhead panel: "THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATION LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS, AND MANUALS. NO ACRO-BATIC MANEUVERS INCLUDING SPINS APPROVED." "AIRSPEED LIMITATIONS. FLAP EXTENSION (APPROACH) 174 KNOTS FLAP EXTENSION (DOWN) 130 KNOTS MAX. GEAR EXTENDED (NOR) 156 KNOTS MIN. SINGLE ENGINE CONTROL 91 KNOTS MAXIMUM MANEUVERING SPEED 169 KNOTS MAX. GEAR RETRACT 130 KNOTS."

Figure 4: Beech King Air placard.[59]

[58] Source: FAA Approved King Air Flight Manual (revised August 31, 1997), page 4-4.
[59] Source: FAA Approved King Air Flight Manual (Revised August 31, 1997), page 4-5.

The following limitations are to be observed in the operation of this airplane equipped with two United Aircraft of Canada, Ltd. PT6A-20 engines.

OPERATING CONDITION	OPERATING LIMITS						
	SHP	TORQUE FT LB	MAXIMUM OBSERVED ITT °C	GAS GEN RPM N_1 (5) %	PROPELLER RPM N_2 RPM	OIL PRESS. PSIG (3)	OIL TEMP. °C
TAKE-OFF (6) (5 Minute Limit)	500	1192	750	101.5	2200	65 - 85	10 to 99
MAX. CONT. (6) (Emergency Use Only)	500	1192	750	101.5	2200	65 - 85	10 to 99
MAX. CLIMB	500	1192	725	–	2200	65 - 85	0 to 99
MAX. Cruise	470	1192	705	–	2200	65 - 85	0 to 99
HI-IDLE (1)	–	–	–	–	–	–	0 to 99
LO-IDLE (2)	–	–	685 (7)	–	–	40 (MIN)	-40 to 99
STARTING	–	–	1090 (4)	–	–	–	-40 (MIN)
ACCELERATION (9)	–	1500(4)	850 (4)	102.6	2200	–	0 to 99
MAX. REVERSE (8)	–	–	–	88	2100	65 - 85	0 to 99
PROP FEATHER	–	525	–	–	–	–	–

(1) At approximately 70% (N_1).

(2) At 50% (N_1) minimum.

(3) Normal oil pressure is 65-85 psig. At throttle settings above 28,000 rpm (75%) N_1 oil pressure between 40 and 65 psig are undesirable, and should be tolerated only for the completion of the flight, preferably at reduced throttle setting. Oil pressures below normal should be reported as an engine discrepancy, and should be corrected before next take-off. Oil pressures below 40 psig are unsafe, and require that either the engine be shut down or a landing be made as soon as possible, using the minimum power required to sustain flight.

(4) This value is time-limited to two seconds.

(5) For every 10°C below -30°C ambient temperature, reduce maximum allowable N_1 by 2.2%.

(6) This rating corresponds to 500 shp up to 30°C ambient temperature, sea level, static conditions.

(7) High ITT at ground idle may be corrected by reducing accessory load and/or increasing N_1 speed.

(8) This operation is time-limited to 1 minute.

(9) High generator loads at low N_1 speeds may cause the ITT acceleration temperature limit to be exceeded. This does not apply during engine start. Observe the following generator load limits:

FAA Approved
Revised: November 30, 1971 **MODEL 65-A90 FAA Flight Manual** 4-

Figure 5: Beech King Air A90 engine limitations.[60]

4.4 Previous N256TA Accident

On July 23, 2016, N256TA was involved in an accident that resulted in substantial damage during a Part 91 skydiving flight in Byron, California. According to the accident report, the airplane entered a spin and suffered structural failure when the right horizontal stabilizer separated from the aircraft. There were no fatalities.[61] The NTSB determined the probable cause(s) of the accident to be:

> *The pilot's failure to maintain an adequate airspeed and his exceedance of the airplane's critical angle of attack, which resulted in an aerodynamic stall and subsequent spin. Also*

[60] Source: FAA Approved King Air Flight Manual (revised November 30, 1971), page 4-1. See Attachment 18 - Beech A90 Engine Limitations.
[61] For additional information on this accident, see NTSB report for case WPR16LA150.

causal to the accident was the pilot's failure to follow prescribed spin recovery procedures, which resulted in increased airspeed and airflow and the subsequent overstress separation of the right horizontal stabilizer. Contributing to the accident was the pilot's inadequate preflight weight and balance calculations, which resulted in the center of gravity being aft of the limit.

For additional information on N256TA's history prior to the June 21, 2019 accident at Dillingham Airfield, Mokuleia, Hawaii, see the Systems and Structures Group Chairman's Factual Report and the Maintenance Records Group Chairman's Factual Report in the docket for this investigation.

4.5 Weight and Balance

According to the FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), Chapter 10, while there are no specified requirements for a pilot operating under Part 91 to conduct weight and balance calculations prior to each flight, 14 *CFR* 91.9 requires the pilot in command (PIC) to comply with the operating limits in the FAA-approved Airplane Flight Manual (AFM).

Title 14 *CFR* 91.9 Civil aircraft flight manual, marking, and placard requirements, stated the following, in part:

(a) Except as provided in paragraph (d) of this section, no person may operate a civil aircraft without complying with the operating limitations specified in the approved Airplane or Rotorcraft Flight Manual, markings, and placards, or as otherwise prescribed by the certificating authority of the country of registry.

Title 14 *CFR* 91.103 Preflight Action, stated the following:

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include -

(a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

(1) For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

(2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

According to the owner of Oahu Parachute Center, his King Air pilots did not conduct a weight and balance for each flight, and instead used a generic "formula" (standard weight). The owner further stated that Oahu Parachute Center weighed each passenger (not for the weight and balance of the airplane) to ensure the total weight of the tandem (gear, tandem instructor and customer) did not exceed 550 pounds, which would exceed the maximum velocity of 150 feet per second (fps) for the drag chute.[62]

A former Oahu Parachute Center King Air pilot told the NTSB that for weight and balance, he ran a sample baseline weight and balance by taking a normal value of fuel, calculated the weights with 13 skydivers (the airplane could hold 13 skydivers plus one pilot) using the passenger weight of 190 pounds per passenger.[63] A baseline center of gravity (CG) was then calculated to ensure that the CG limits would remain in aircraft limitations for loads involving 13 passengers or less.[64] The former Oahu Parachute Center King Air pilot said Oahu Parachute Center did weigh the customers for each flight so that the "tandem master" would know that the combined weight of the tandem would not exceed the requirements for the parachute.[65]

The baseline weight and balance used to calculate the CG of the King Air with 13 passengers using standard FAA AC 120-27E suggested passenger weights did not include the weights of each tandem parachute system, single parachute system, or customer harnesses.

4.5.1 Aircraft Fueling

According to the Beechcraft King Air A90 Pilot Operating Manual (revised February 9, 1977), page 2-6, the airplane had one wing fuel tank and one main (nacelle) fuel tank in each wing. Both the right and left hand systems were independent of each other and were connected only by a crossfeed system. Fuel under pressure was supplied to each engine by a submerged boost pump in each main tank. Automatic fuel transfer from the wing tanks to the main (nacelle) tanks began when the TRANSFER PUMP switches were turned on, unless the main (nacelle) tanks were full. The main (nacelle) tanks would continue to fill until the fuel reached the upper transfer limit and a float switch turned the pump off. As the engine burned fuel from the main (nacelle) tank, fuel from the wing tanks transferred automatically into the main (nacelle) tank each time its level dropped approximately 8 gallons.

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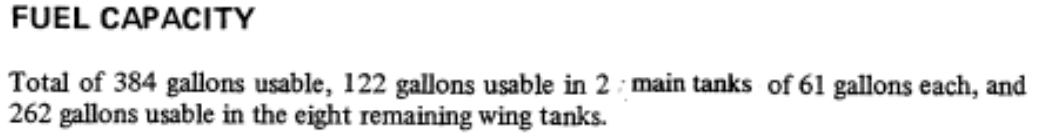
[62] Oahu Parachute Center's tandem instructors used Sigma Tandem System parachute systems, manufactured by United Parachute Technologies, LLC in DeLand, Florida. All sizes of the UPT PD Sigma Tandem Main Canopy, as well as the VR-360 Reserve Canopy, have an approved gross weight limit of 500 lbs., which is approximately 50 pounds of gear and 450 pounds of total jumper weight (tandem instructor and customer). Source: https://uptvector.com/bulletins-and-newsletters/.

[63] FAA AC 120-27E listed an average adult passenger weight of 190 pounds. FAA AC 120-27E, dated June 10, 2005, was cancelled on May 6, 2019 and replaced with AC 120-27F, dated May 6, 2019.

[64] The NTSB was not provided with a verification of this "sample" weight and balance.

[65] According to the Oahu Parachute Center's owner, the tandem parachute system weighed about 58 pounds each, the customers tandem harness weighed about 8 pounds each, and the solo jumper parachute systems weighed about 25 pounds each. For the weight and balance of the airplane, the pilot would ensure that all passengers sat on the straddle benches, and no passengers were aft of the benches past the open door. See Attachment 1 - Interview Summaries.

According to the Northshore Aviation fueling records, the accident airplane was fueled on the morning of June 21, 2019 with 152 gallons of fuel.[66] According to the fueler, Oahu Parachute Center pilots usually did not take off with over a half load fuel. On June 21, 2019, he believed there was likely little fuel in the wing tanks before he fueled the airplane, and the nacelle [main] tanks likely had about 15-20 gallons in each tank. The fueler said Oahu Parachute Center could do five (5) loads (flights) in the King Air easily with reserves with the fuel load provided since each flight burned about 25 gallons.



FUEL CAPACITY

Total of 384 gallons usable, 122 gallons usable in 2 main tanks of 61 gallons each, and 262 gallons usable in the eight remaining wing tanks.

Figure 6: Beech King Air A90 fuel capacity.[67]

The NTSB estimated that the accident flight taxied out with 85 gallons (570 pounds) of fuel, and departed with about 77 (515 pounds) gallons onboard N256TA .

4.5.2 Estimated Weight and Balance

The accident airplane's basic empty weight was determined from a photo of the accident airplane's FAA-approved Flight Manual, taken by a former OPC King Air pilot and provided to the NTSB.[68]

To calculate the total weight of the passengers onboard the accident flight, the NTSB used the following sources:

- The pilot's weight was taken from his most recent 2nd Class Medical application.
- Four Oahu Parachute passengers completed manifest forms that included their claimed weights.
- State driver's license information was used for three passengers.
- A standard weight of 190 pounds was used for the remaining three passengers (no reliable weight information was available for these three passenger

[66] See Attachment 11 – Weight and Balance. The fuel truck was loaded with fuel supplied by Epic Aviation from a facility located in Honolulu. For testing samples, see the Powerplants Group Chairman's Factual Report in the docket for this investigation.
[67] Source: FAA Approved King air Flight Manual (revised February 13, 1977), page 4-3.
[68] See Attachment 11 - Weight and Balance.

WEIGHT & BALANCE (maximum certificated weights in **bold**) (weight in pounds)		
	Basic Operating Weight	5,158[69]
	Pilot and Passenger Weights	1,948
	Parachute Gear Weight	304
	Zero Fuel Weight	7,410
	Maximum Zero Fuel Weight	**n/a[70]**
	Fuel Weight (85 gallons)[71]	570
	Ramp Weight	7,980
	Taxi Fuel Burn[72]	-55
	Takeoff Weight (estimated)	7,925
	Maximum Takeoff Weight	**9,300**
	Maximum Landing Weight	**8,835**

[69] According to the King Air A90 POH, the maximum empty weight was 5,600 lbs. According to aircraft records, the co-pilot seat was not included in the basic operating weight of the accident airplane. The co-pilot's seat was installed on the accident airplane, and weighed 28 pounds (arm +131). Source: Textron email sent to the NTSB on March 11, 2010.

[70] According to the King Air A90 POH (Section 4-4), the King Air A90 did not have a maximum zero fuel weight.

[71] According to the fueler at HDH, the wing tanks had about 20 gallons each, and the nacelle tanks were full at 60 gallons each at the beginning of the day on June 21, 2019 (total of 160 gallons). It was estimated that the three previous flights on June 21, 2019 burned a total of 75 gallons.

[72] Source: King Air A90 POH (Section 10-4).

4.5.3 King Air Center of Gravity Chart

MAXIMUM WEIGHT

Maximum take-off weight varies with airport altitude and ambient temperature. The maximum allowable take-off weight must not exceed the limit taken from the Maximum Take-Off Weight graph on page 7-7 and never exceed 9300 pounds.

Maximum landing weight is 8835 pounds for all conditions.

Maximum zero fuel weight: NO LIMITATION.

CENTER OF GRAVITY LIMITS (Landing Gear Extended)

Aft Limit: 160.4 inches aft of datum at all weights.
Forward Limit: At 9300 lbs., 152.2 inches aft of datum; at 7750 lbs. or less, 147.6 inches aft of datum.

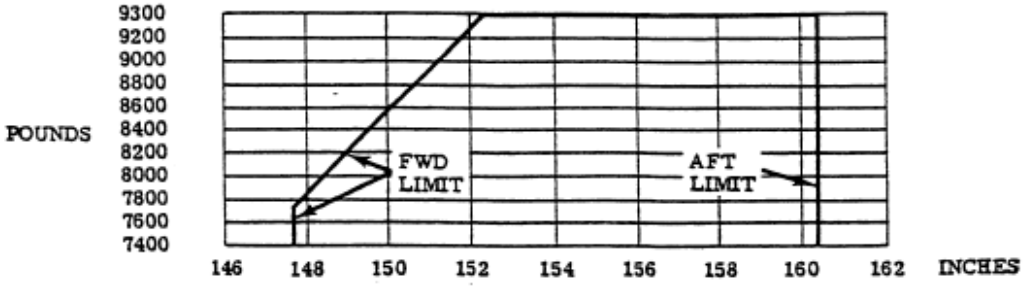


Figure 7: Beech King Air A90 weight and center of gravity limitations.[73]

4.5.4 Center of Gravity for Accident Flight

The NTSB used available evidence from the investigation to determine the most forward and aft possible centers of gravity for the accident flight.[74] The NTSB estimated that, assuming all passengers in the cabin were seated on the two bench seats with one passenger sitting in the reversed co-pilot seat, the center of gravity at takeoff would have been about 156.65 inches for 7,925 pounds.

According to the FAA-Approved King Air Flight Manual (revised August 31, 1997), page 4-4, the aft center of gravity limit (with the landing gear extended) was 160.4 inches.

5.0 Airport Information[75]

Dillingham Airfield (Kawaihapai Airfield) was located two miles west of Mokuleia, Hawaii (about 22.1 miles west northwest of Honolulu, Hawaii). It had a latitude and longitude of 21-34-46.1050N / 158-11-50.2130W and a surveyed elevation of 14.2 feet above sea level. The magnetic variation of the airport was 11E (as of 1985) and was in a time zone of UTC -10 (year round; does

[73] Source: FAA-Approved King Air Flight Manual (revised August 31, 1997), page 4-4.
[74] Individual passenger location in the airplane's cabin at takeoff was derived from the HNL Medical Examiner's chart depicting victim location at the accident site.
[75] For additional information, see Attachment 12 - Dillingham Airfield FAA Information.

not observe Daylight Savings Time). Dillingham Airfield was a non-towered airport (no operating control tower), and the airspace surrounding the airport was Class G uncontrolled airspace.[76]

According to Hawaii state records,[77] Dillingham Airfield (HDH) was a general aviation airport operated by the Hawaii Department of Transportation under a 25-year lease from the U.S. Army through a 2009 Joint-Use Agreement. The state leased 272 acres of the 650 acre Dillingham Military Reservation and operated the single 9,007-foot long runway primarily for commercial glider and sky diving operations.

The field was a joint-use with the Army having first priority for air-land operations and helicopter night-vision training. The Airfield was not lighted for night operations by general aviation. Oahu District of the State Airports System operated and maintained the Airfield and utilities systems.

According to the Deputy, Plans and Programs/Chief, Support Agreements (15 WG/XP, Hickam Field), the Air Force did not have any Support Agreements or Memorandum of Understandings (MOU's) with Dillingham Airfield. The US Army still owned the Airfield and leased the runway to the state, and the State of Hawaii DOT had day-to-day operational oversight of air operations at HDH.[78]

Hangars for fixed wing aircraft and gliders, bathrooms and a Unicom Tower/fire station were added in 1985-1986. Master plans for Dillingham were accomplished in 1980 and 1993 along with an environmental assessment in 2000.

The Defense Authorization Act of 1990 provided that the 67 acres of ceded land of old Camp Kawaihapai be transferred to the state after an agreement on future joint-use of the Airfield was reached.

According to the most recent State of Hawaii, Department of Transportation, Airports Division statistics, in 2010 there were combined 17,338 air operations at HDH, and 49,758 air operations in 2009.[79]

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[76] See 14 *CFR* 91.126 Operating on or in the vicinity of an airport in Class G airspace. The FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), page 15-3 states "*Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been designated as Class A, B, C, D, or E. It is therefore designated uncontrolled airspace. Class G airspace extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, pilots should remember these are visual flight rules (VFR) minimums that apply to Class G airspace."* Class E airspace is controlled airspace that provides sufficient airspace for the safe control and separation of aircraft during instrument flight rules (IFR) operations.

[77] Source: http://airports.hawaii.gov/hdh/.

[78] Source: Email sent to the NTSB from the Deputy, Plans and Programs/Chief, Support Agreements 15 WG/XP, Hickam Field, sent Wednesday, June 26, 2019 5:54 PM.

[79] Source: https://aviation.hawaii.gov/airfields-airports/oahu/dillingham-field/dillingham-field-air-traffic-statistics/ .

Figure 8: Dillingham Airfield.[80]

5.1 Runway Information[81]

Dillingham Airfield had two runways on a single asphalt surface with rubberized friction seal coat. Runway 08 (080º magnetic, 091º true) and runway 26 (260º magnetic and 271º true) was 9,007 feet long and 75 feet wide. According to the FAA Airport Facility Directory, a 5,000 feet x 75 feet runway for light powered aircraft was painted in the center of the existing 9,007 foot paved area for civilian use starting approximately 2,000 feet from each runway end. Runway 08 had a 1,993 foot displaced threshold to accommodate glider operations on the west side of the airfield, and a 1,995 foot displaced threshold to accommodate the parachute drop zone (DZ) on the east end of the Airfield. The runway was closed daily between 0800-1700Z (2200 to 0700 local time) to allow for military training at the airport.[82]

[80] Source: Hawaii Department of Transportation, http://airports.hawaii.gov/hdh/.
[81] Source: AirNav.com and FAA.
[82] See Attachment 12 - Dillingham Airfield FAA Information.

Figure 9: Sectional chart depicting HDH.[83]

5.2 HDH Procedures

According to FAA AC 105-2E Sport Parachuting (dated December 4, 2013), a large number of airports that accommodate parachute operations also have different kinds of aviation activities taking place simultaneously, including flight instruction, glider and helicopter operations, emergency medical services, sightseeing operations, and aerobatic practice over or in the immediate vicinity of the airport. Many airports accommodate a large volume of transient traffic during skydiving operations.

The FAA recommends that shared facility airports have operating procedures so that each activity can operate safely by knowing the procedures for each of the activities. Representatives of each type of activity can operate more effectively by knowing the procedures with other user groups. Airport management must ensure that airport policies and procedures are kept current, which can be accomplished via regularly scheduled meetings with all airport users.

The State of Hawaii, Department of Transportation, Airports Division published a Hawaii Airports and Flying Safety Guide (dated 2012-2013, fifth edition, revision 1), which contained the following information and guidance for HDH operations:

[83] Source: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/vfr/

Procedures:

All aircraft must contact Dillingham Unicom prior to entering the traffic pattern and maintain contact when operating in the Dillingham area. All traffic north of runway. It is common practice to call unicom on base leg in addition to the call when entering the pattern. A 5,000' by 75' runway for powered aircraft is identified by standard airport pavement markings. The powered aircraft thresholds have been displaced 2,000' to provide runway for sailplane operations. Powered aircraft shall keep base leg in close, and cross the airport boundary fence on final approach at or above 600' MSL in order to assure safe separation from sailplanes using the first 2,000' (short of the displaced threshold). Recommended standard pattern entry is illustrated. **Do not overfly active drop zones. Do not overfly noise sensitive areas north of airfield.**

CAUTION: Extensive glider operations and parachute jumping off Rwy 8 and Rwy 26. Aerobatic training area off-shore above the downwind leg 1,500' MSL and above. When transiting the area, cross the field above 2,000' MSL.

No civil operations between sunset and sunrise. Extensive night operations by military helicopters.

Glider Operations:

Gliders are normally air-towed and routinely depart the traffic pattern to the South. (Right turn after takeoff Rwy 8; Left turn after takeoff Rwy 26). Gliders normally fly the ridge line to the South of the airport, within 5nm. Most gliders are not radio equipped. The powered aircraft towing the gliders have radios and routinely use the glider traffic pattern, entering the traffic pattern mid-field from the South.

Sky Dive Operations:

Extensive parachute operations occur daily at 16,000' and below. Parachutists normally exit the aircraft upwind of the airport and during strong winds may exit as far as 2 nautical miles from the drop zone. Parachutes are usually opened between 2,000' and 4,500' altitude, and then flow to the drop zone entering an abbreviated left traffic pattern (Rwy 8) or right traffic pattern (Rwy 26). During light and no wind conditions, the parachutes may open directly above the airport and adjacent beach area.

Figure 10: State of Hawaii guidance and procedures for HDH.[84]

[84] Source: Hawaii Airports and Flying Safety Guide (2012-2013, rev. 1), as provided to the NTSB by the FAA.

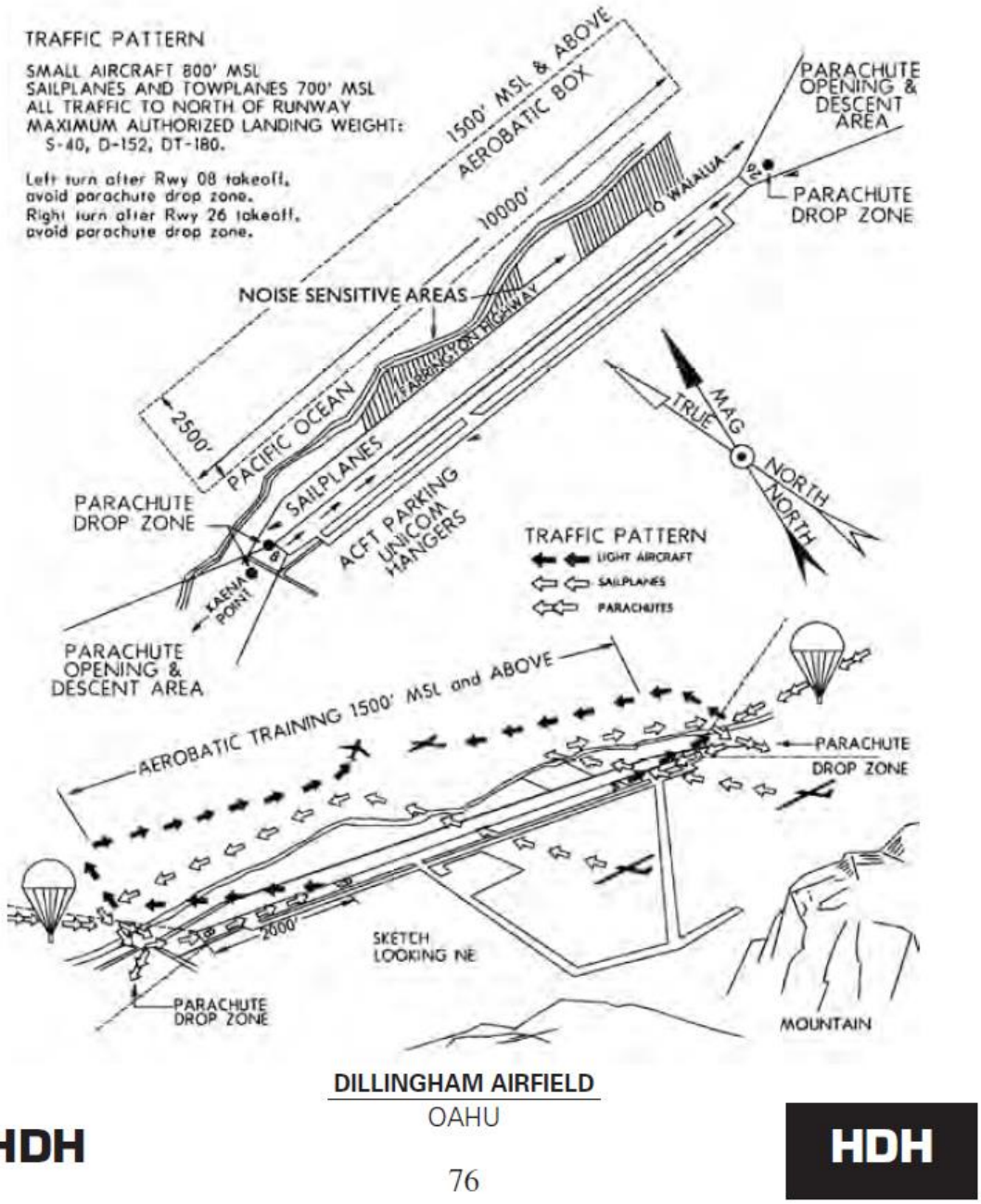

Figure 11: State of Hawaii traffic pattern procedures for HDH. [85]

According to multiple Oahu Parachute Center King Air pilots, for takeoff departures on runway 8 departures, they would turn left mid-field and fly over the beach park to avoid the noise-sensitive

[85] Source: Hawaii Airports and Flying Safety Guide (2012-2013, rev. 1), as provided to the NTSB by the FAA.

areas along the beach, and avoid the drop zone (DZ) on the east end of the runway where the parachutists were landing.[86]

Figure 12: Google Earth image of Dillingham Airfield. The red circle indicates the beach area pilots were directed to fly over on runway 08 departures to avoid the noise sensitive areas.

5.3 Intersection Departure

According to the Aeronautical Information Manual (AIM) dated August 15, 2019, page PCG I-5, an intersection departure was a departure from any runway intersection except the end of the runway. A departure from the intersection taxiway on runway 08 (located about midpoint on the runway) at HDH would have provided about 4,500 feet runway remaining for departure (including the displaced threshold east of runway 08) (see Figure 13).[87]

[86] For additional information on the regulatory requirements, recommended operations, and communications procedures for operating at an airport without a control tower (like HDH), and suggested traffic patterns for parachute operations, see FAA AC 90-66B Non-Towered Airport Flight Operations, dated March 13, 2018.

[87] In September 2017, the NTSB published NTSB Safety Alert #71 "Do your takeoff Homework; Runway Length Matters" that discussed the potential hazards associated with intersection takeoffs in general aviation.

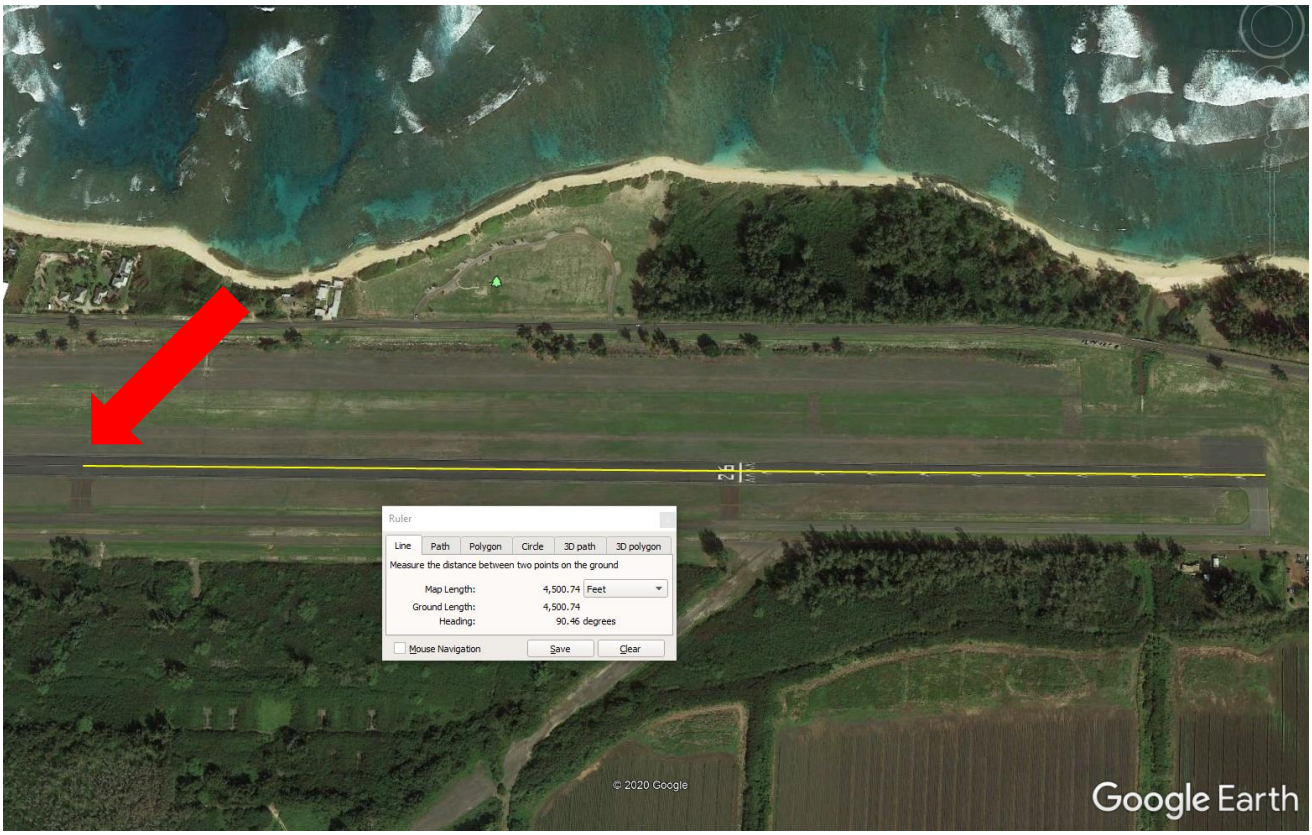

Figure 13: Google Earth image showing measurement from the mid-runway intersection on HDH runway 08 to the end of the runway. The red arrow indicates the location of the runway 08 intersection.

5.4 Reports on Accident Pilot's Takeoff/Departure Technique

Multiple witnesses, former Oahu Parachute Center King Air pilots and employees advised the NTSB of specific takeoff techniques incorporated by the accident pilot, primarily off runway 08 at HDH.[88] For instance:

- One former Oahu Parachute Center pilot stated that the accident pilot would bank hard and pitch up aggressively on departures, and he had seen him do that as a "thrill ride" for the passengers. He said the pilot would also do negative-G dives for the "weightless" effect for fun, but he heard some jumpers would complain. He said the accident pilot told him he had done barrel rolls in the accident airplane, but not with passengers. When asked if the accident pilot had ever received acrobatic training, he said no. When he talked to the accident pilot about doing these maneuvers and putting excessive stress on the airplane, the pilot's response was always that the passengers seemed to like it and did not complain to him. He reminded the accident pilot (and the Oahu Parachute Center contract mechanic) about the previous tail repair following an earlier accident, and the mechanic was unhappy with what the pilot was doing to the airplane.

[88] See Attachment 1 – Interview Summaries, Attachment 2 – Records of Conversation, and Attachment 13 - Previous Flight Witness Statements.

• An Oahu Parachute Center tandem instructor stated that on his flights with the accident pilot, it felt like he was pitching and banking to get out of the traffic pattern area, but would not say it was overly "aggressive." He did not know by how much they were clearing the trees next to the road on departure. He said for all 4 of his flights with pilot, the departures were the same.

• A Sky Dive Hawaii pilot stated that as a new pilot, he observed the accident pilot fly normal takeoffs and landings, although he had a little trouble handling the radios. However, in the last weeks (prior to the accident), he noticed that the pilot had changed his takeoff profile on runway 8, and appeared to be showing off. He would take the airplane off and stay above the runway in ground effect,[89] lift the gear up and let the airplane accelerate, and then would pitch up and begin banking to the left prior to the threshold of runway 26. He would rotate the airplane and bank simultaneously. He said it looked like the pilot was trying to get the most out of the airplane when he was using a high pitch and bank, clearing the ironwood trees that lined the highway by about 50 feet. He said the bank angles were greater than 45 degrees.

• Another former Oahu Parachute Center King Air pilot stated that at HDH there were always jumpers coming down, so banking hard at 100 feet off the ground after takeoff to avoid the landing area for the parachutists was not unusual to make the turn over the beach park.

• An experienced parachutist on the flight prior to the accident flight stated that his takeoff was not alarming, but the left bank was enough for him to notice. He said the pitch on the takeoff was fine, it was just the steep bank, then a flattening out, then steep again that was noticeable.

• Another experienced parachutist on the flight prior to the accident flight stated that on takeoff the airplane began a left bank lower than he was accustomed to seeing. He stated that he had seen other pilots accelerate in ground effect, but did not think that the pilot had done that on their flight. He stated that the pilots left turn out on his flight had been more aggressive than what he would consider normal. He also said that at some point in the left, climbing turnout, the pilot had briefly relaxed the turn, then resumed the more aggressive profile and he felt the resumption of G-forces.

• Another parachutist on the flight prior to the accident flight (who said he was not an "aircraft expert") stated that others on the flight mentioned the pilot executed a low, aggressive turn on departure. Other passengers on the flight told him this was not normal.

• Another experienced parachutist on the flight prior to the accident flight characterized the takeoff as a little "spicey" for his liking. He stated that the pilot definitely banked it a little hard on a high rate turn at a seemingly low altitude. He believed it was an unspoken practice at that

[89] Ground effect is a condition of improved performance encountered when the airplane is operating very close to the ground. Ground effect can be detected and normally occurs up to an altitude equal to one wingspan above the surface. Source: FAA Airplane Flying Handbook (H-8083-3B Chapter 5).

airport that the pilots began the left turn when reaching the end of the runway as not to overfly the field. As a pilot, he said he personally would have climbed a little higher if he was piloting before turning left over the fence.

- An Oahu Parachute Center employee who witnessed the accident said on a previous flight he noted that the takeoff was not typical for the King Air planes that he had previously jumped on, and the takeoff seemed more aggressive than usual (faster and stayed in ground effect longer) and when they reached somewhere around 200 feet or so there was an abrupt leveling off before the plane turned left and continued climbing out. At the time he attributed it to the fact that the SOP was to quickly turn left so that the plane didn't intersect the skydiver landing area at the end of the runway, but his recollection was that the leveling out and the bank were more aggressive than they needed to be.

Title 14 *CFR* 105.5 General, stated the following:

> *No person may conduct a parachute operation, and no pilot in command of an aircraft may allow a parachute operation to be conducted from an aircraft, if that operation creates a hazard to air traffic or to persons or property on the surface.*

Title 14 *CFR* 91.13 Careless or reckless operation, stated the following:

> *(a) Aircraft operations for the purpose of air navigation. No person may operate an aircraft in a careless or reckless manner so as to endanger the life or property of another.*
> *(b) Aircraft operations other than for the purpose of air navigation. No person may operate an aircraft, other than for the purpose of air navigation, on any part of the surface of an airport used by aircraft for air commerce (including areas used by those aircraft for receiving or discharging persons or cargo), in a careless or reckless manner so as to endanger the life or property of another.*

Title 14 *CFR* 91.303 Aerobatic flight, stated the following:

> *No person may operate an aircraft in aerobatic flight -*
>
> *(a) Over any congested area of a city, town, or settlement;*
>
> *(b) Over an open air assembly of persons;*
>
> *(c) Within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport;*
>
> *(d) Within 4 nautical miles of the center line of any Federal airway;*
>
> *(e) Below an altitude of 1,500 feet above the surface; or*
>
> *(f) When flight visibility is less than 3 statute miles.*

For the purposes of this section, aerobatic flight means an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.

Title 14 CFR § 91.307 Parachutes and parachuting, stated the following, in part:

(c) Unless each occupant of the aircraft is wearing an approved parachute, no pilot of a civil aircraft carrying any person (other than a crewmember) may execute any intentional maneuver that exceeds -

(1) A bank of 60 degrees relative to the horizon; or
(2) A nose-up or nose-down attitude of 30 degrees relative to the horizon.

6.0 Weather and Notices to Airmen (NOTAMs)

6.1 Weather

Dillingham Airfield, Mokuleia, HI, did not have weather reporting capability. The closest reporting station was 14 miles southeast at Wheeler Airfield (PHHI), Wahiawa, HI, at an elevation of 843 ft. The conditions reported there surrounding the period were as follows:

SPECI PHHI 220346Z 17007KT 10SM FEW011 SCT019 BKN026 BKN032 24/22 A2992 RMK AO2A CIG 011V027 BKN011 V SCT SLP123 $=
METAR PHHI 220356Z 18006KT 10SM FEW013 BKN060 24/21 A2993 RMK AO2A SLP127 T02390208 $=

Accident 0422Z

METAR PHHI 220456Z 18004KT 10SM FEW050 BKN070 24/20 A2994 RMK AO2A SLP129 T02400197 $=
METAR PHHI 220556Z AUTO 13003KT 10SM SCT050 24/20 A2995 RMK AO2 SLP130 60001 T02380195 10266 20236 52013 $=

TAF PHHI 212300Z 2123/2305 14009KT 9999 SCT025 BKN035 BKN060 QNH2989INS
TEMPO 2123/2205 8000 -SHRA BKN025
BECMG 2206/2207 VRB06KT 9999 SCT030 BKN035 QNH2992INS
BECMG 2218/2219 13010KT 9999 FEW025 SCT035 BKN040 QNH2995INS
TEMPO 2301/2305 8000 -SHRA BKN025
TX28/2223Z TN20/2215Z=

On June 21, 2019, Mokuleia, Hawaii sunset occurred at 1913 HST.

6.2 Satellite Imagery

The GOES-17 visible image at 1846 HST (0446Z) is included below which shows multiple cloud layers over HDH. No cumulonimbus clouds were observed in the vicinity of the airport during the period.

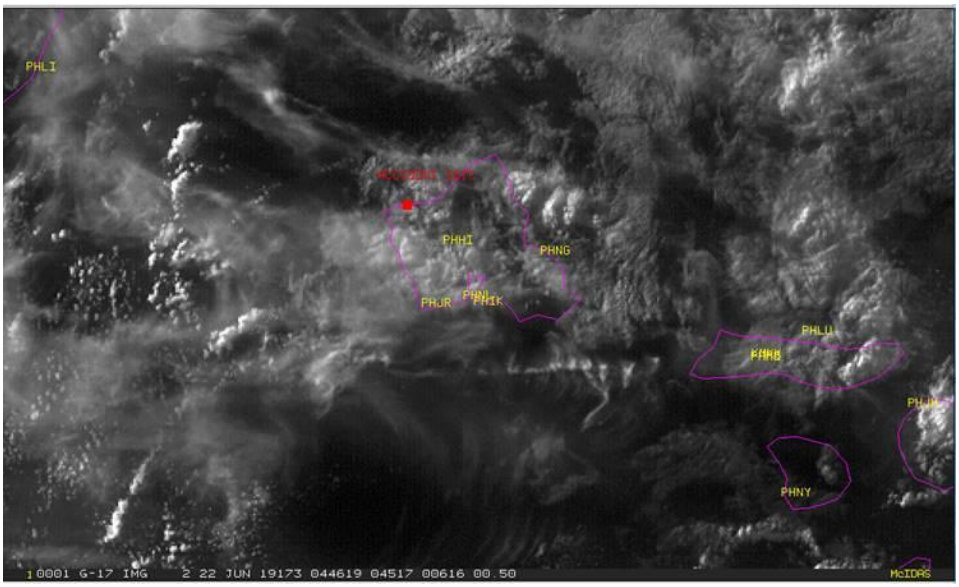

Figure 14: GOES-17 visible image at 1846 HST.

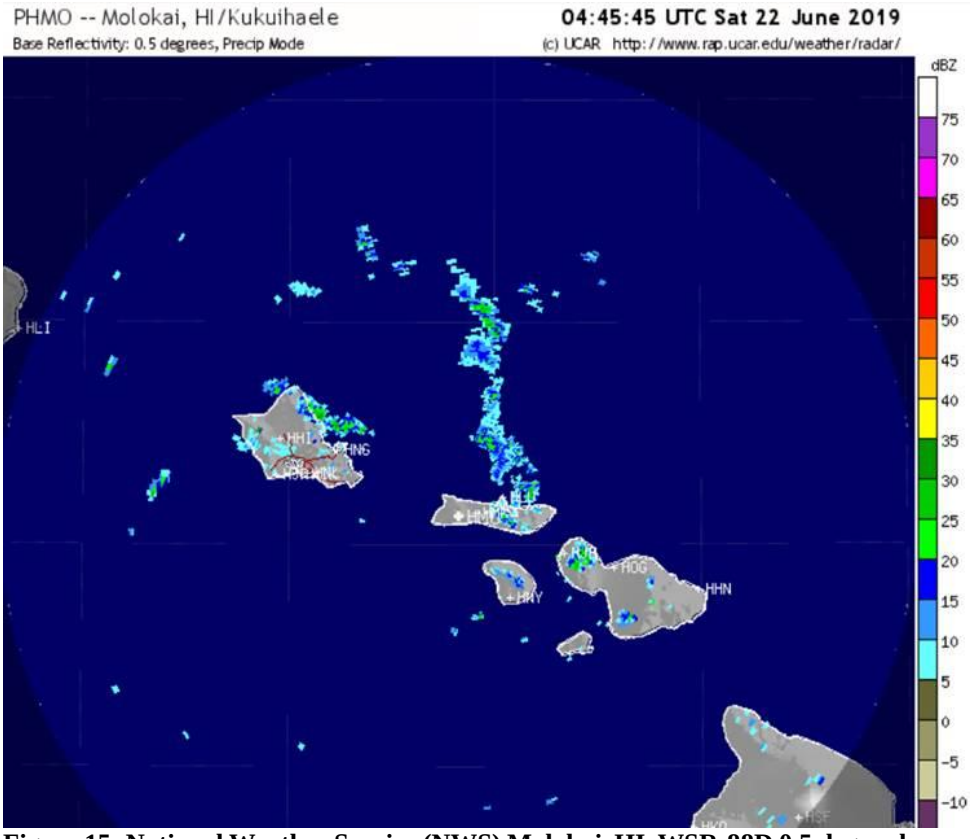

Figure 15: National Weather Service (NWS) Molokai, HI, WSR-88D 0.5 degree base reflectivity image for 1845 HST.

6.3 NOTAMs

PHDH DILLINGHAM AIRFIELD

12/142 - OBST TOWER LGT (ASR 1026419) 213958.00N1575959.00W (11.1NM ENE HDH) 1219.8FT (210.0FT AGL) U/S. 13 DEC 22:39 2019 UNTIL 12 MAR 23:59 2020. CREATED: 13 DEC 22:39 2019

06/191 - RWY 08/26 CLSD. 22 JUN 09:50 2019 UNTIL 25 JUN 05:00 2019. CREATED: 22 JUN 09:50 2019

6.4 Sport Parachuting Weather Requirements

Title 14 *CFR* 105.17 Flight visibility and clearance from cloud requirements, stated the following:

No person may conduct a parachute operation, and no pilot in command of an aircraft may allow a parachute operation to be conducted from that aircraft -

(a) Into or through a cloud, or

(b) When the flight visibility or the distance from any cloud is less than that prescribed in the following table:

Altitude	Flight visibility (statute miles)	Distance from clouds
1,200 feet or less above the surface regardless of the MSL altitude	3	500 feet below, 1,000 feet above, 2,000 feet horizontal.
More than 1,200 feet above the surface but less than 10,000 feet MSL	3	500 feet below, 1,000 feet above, 2,000 feet horizontal.
More than 1,200 feet above the surface and at or above 10,000 feet MSL	5	1,000 feet below, 1,000 feet above, 1 mile horizontal

Table 1: Title 14 *CFR* 105.17 Flight visibility and clearance from cloud requirements.

7.0 Air Traffic Control

In general, two types of radar were used to provide position and track information for aircraft cruising at high altitudes between airport terminal airspaces, and for those operating at low altitude and speeds within terminal airspaces such as Hawaii Control Facility (HCF).

Air Route Surveillance Radars (ARSRs) were long range (250 nm) radars used to track aircraft cruising between terminal airspaces. ARSR antennae rotate at 5 to 6 rotations per minute (rpm), resulting in a radar return every 10 to 12 seconds. Airport Surveillance Radars (ASRs) were short range (60 nm) radars used to provide air traffic control services in terminal areas. ASR antennas rotated at 13 to 14 rpm, resulting in a radar return every 4.8 to 5 seconds.

A radar detected the position of an object by broadcasting an electronic signal that was reflected by the object and returned to the radar antenna. These reflected signals were called primary returns. Knowing the speed of the radar signal and the time interval between when the signal was broadcast and when it was returned, the distance, or range, from the radar antenna to the reflecting object could be determined. Knowing the direction, the radar antenna was pointing when the signal was broadcast, the direction (or bearing, or azimuth) from the radar to the object could be determined. Range and azimuth from the radar to the object defined the object's position.

To improve the consistency and reliability of radar returns, aircraft were equipped with transponders that sense beacon interrogator signals broadcast from radar sites, and in turn broadcast a response signal. Even if the radar site was unable to sense a weak reflected primary return, it would sense the response signal broadcast by the transponder and be able to determine the aircraft position. The response signal could also contain additional information, such as the identifying "beacon code" for the aircraft, and the aircraft's pressure altitude (also called "Mode C" altitude). Transponder signals received by the radar site were called secondary returns. The accident aircraft was not assigned an ATC discreet transponder code and was believed to be squawking 1200, therefore positive identification by radar could not be made.

Radar data for this accident was obtained from the FAA at HCF and was derived from the HCF ASR sensor. The HCF En Route Radar Intelligent Tool (ERIT) data was of good quality and was part of the Micro En Route Automated Tracking System (MEARTS) utilized by air traffic control. Additional data was obtained from a commercially available product; Harris OpsVue track data.

The radar data available to NTSB investigators identified three (3) potential flights the accident aircraft had flown the day of the accident. All of the flights were compared to the known performance of the Beechcraft 65-90 King Air but could not be positively identified because the accident aircraft was not assigned a discreet transponder code. However, based on known time of the previous flights, and the aircraft performance, investigators identified three (3) potential flights flown by the accident aircraft on the date of the accident.[90]

[90] According to interviews, the other two drop zones operator (DZOs) located at Dillingham Airfield did not operate on the day of the accident.

The first possible flight was about 0820 HST. The flight departed and climbed to about 14,000 feet before returning to the Dillingham Airfield.[91] The next possible flight was about 0930 and departed to the west before making a right turn and climbing to about 14,000 feet. Investigators on site obtained GoPro video cameras that were downloaded about 0920 on the date of the accident. It had been suggested that these videos may be from the first flight of the day (0820). The third flight was reported to be the flight immediately before the accident flight and was the last flight from Dillingham Airfield before the accident. The flight departed at about 1725 HST and climbed to an altitude of about 13500 feet before returning to Dillingham. There were no further flights detected by radar from the Dillingham airport on June 21, 2019.

According to the FAA Principal Maintenance Inspector OJT Program Manager in Honolulu, HI, the FAA was unable to find any audio communications from the accident airplane on June 21, 2019. There was an intermittent Emergency Locator Transmitter (ELT) report by an aircraft inbound to Lihue Airport (LIH), Lihue, Hawaii at 1824. Following a review of ATC audio, from 1700-1900 there was no contact from the accident airplane advising of any parachute drops. At 1824, the Coast Guard called the FAA to advise that they were receiving an emergency locator transmitter (ELT) from the accident airplane. At 1831, fire rescue called the FAA and advised of an aircraft down at HDH

Title 14 *CFR* 105.13 Radio equipment and use requirements, stated the following:

(a) Except when otherwise authorized by air traffic control -

(1) No person may conduct a parachute operation, and no pilot in command of an aircraft may allow a parachute operation to be conducted from that aircraft, in or into controlled airspace unless, during that flight -

(i) The aircraft is equipped with a functioning two-way radio communication system appropriate to the air traffic control facilities being used; and

(ii) Radio communications have been established between the aircraft and the air traffic control facility having jurisdiction over the affected airspace of the first intended exit altitude at least 5 minutes before the parachute operation begins. The pilot in command must establish radio communications to receive information regarding air traffic activity in the vicinity of the parachute operation.

(2) The pilot in command of an aircraft used for any parachute operation in or into controlled airspace must, during each flight -

(i) Continuously monitor the appropriate frequency of the aircraft's radio communications system from the time radio communications are first established between the aircraft and air traffic control, until the pilot advises air traffic control that the parachute operation has ended for that flight.

(ii) Advise air traffic control when the last parachutist or object leaves the aircraft.

[91] Title 14 *CFR* 91.211 states that pilots must use oxygen when flying above 14,000 feet mean sea level (msl). Operators must provide oxygen to occupants when the jump plane is above 15,000 msl, and above 25,000 feet msl, occupants should use pressure demand oxygen systems.

(b) Parachute operations must be aborted if, prior to receipt of a required air traffic control authorization, or during any parachute operation in or into controlled airspace, the required radio communications system is or becomes inoperative.

Title 14 *CFR* 105.25 Parachute operations in designated airspace, stated the following, in part:

(a) No person may conduct a parachute operation, and no pilot in command of an aircraft may allow a parachute operation to be conducted from that aircraft -

(1) Over or within a restricted area or prohibited area unless the controlling agency of the area concerned has authorized that parachute operation;

(2) Within or into a Class A, B, C, D airspace area without, or in violation of the requirements of, an air traffic control authorization issued under this section;

(3) Except as provided in paragraph (c) and (d) of this section, within or into Class E or G airspace area unless the air traffic control facility having jurisdiction over the airspace at the first intended exit altitude is notified of the parachute operation no earlier than 24 hours before or no later than 1 hour before the parachute operation begins.

(b) Each request for a parachute operation authorization or notification required under this section must be submitted to the air traffic control facility having jurisdiction over the airspace at the first intended exit altitude and must include the information prescribed by § 105.15(a) of this part.

(c) For the purposes of paragraph (a)(3) of this section, air traffic control facilities may accept a written notification from an organization that conducts parachute operations and lists the scheduled series of parachute operations to be conducted over a stated period of time not longer than 12 calendar months. The notification must contain the information prescribed by § 105.15(a) of this part, identify the responsible persons associated with that parachute operation, and be submitted at least 15 days, but not more than 30 days, before the parachute operation begins. The FAA may revoke the acceptance of the notification for any failure of the organization conducting the parachute operations to comply with its requirements.

According to the Aeronautical Information Manual (AIM)[92] dated August 15, 2019, paragraph 3-5-4 stated the following, in part:

a. Procedures relating to parachute jump areas are contained in 14 CFR Part 105. Tabulations of parachute jump areas in the U.S. are contained in the A/FD.[93]

b. Pilots of aircraft engaged in parachute jump operations are reminded that all reported altitudes must be in reference to mean sea level, or flight level, as

[92] The Aeronautical Information Manual (AIM) is the FAA's official guide to basic flight information and Air traffic control (ATC) procedures. The AIM contains the basic aeronautical knowledge information required to fly in the United States National Airspace System. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms used in the ATC System, and information on safety, accident, and hazard reporting.

[93] Airport/Facility Directory. See Attachment 12 - Dillingham Airfield FAA Information.

appropriate to mean sea level, as appropriate, to enable ATC to provide meaningful traffic information.

c. *Parachute operations in the vicinity of an airport without an operating control tower – there is no substitute for alertness while in the vicinity of an airport. It is essential that pilots conducting parachute operations be alert, look for other traffic, and exchange traffic information as recommended in paragraph 4-1-9 Traffic Advisory Practices at Airport Without Operating Control Towers. In addition, Pilots should avoid releasing parachutes while in an airport traffic pattern. Pilots should make appropriate broadcasts on the designated Common Traffic Advisory Frequency (CTAF), and monitor that CTAF until all parachute activity has terminated or the aircraft has left the area. Prior to commencing a jump operation, the pilot should broadcast the aircraft's altitude and position in relation to the airport, the appropriate relative time when the jump will commence and terminate, and listen to the position reports of other aircraft in the area.*

According to the FAA, there were no communications (audio or written) on June 21, 2019 between N256TA and the ATC facility (Hawaii Control Facility - HCF) having jurisdiction over the Class G airspace covering HDH (Dillingham Airfield), as prescribed in 14 *CFR* 105.25(a)(3).

Further, there was no written correspondence between Oahu Parachute Center (operator of N256TA) and the ATC facility (Hawaii Control Facility - HCF) having jurisdiction over the Class G airspace covering HDH (Dillingham Airfield), including the information prescribed in 14 *CFR* 105.15(a). The FAA also did not have anything on file for Oahu Parachute Center providing yearly notice of parachute operations as prescribed in 14 *CFR* 105.25(c).[94]

[94] Source: FAA email sent to the NTSB on Monday, January 13, 2020 12:09 PM.

7.1 Radar Plots[95]

Figure 16: Radar track of last flight off of HDH (presumably N256TA).

Figure 17: Radar track of last flight off HDH (presumably N256TA) (2).

[95] The radar plots are all for June 21, 2019.

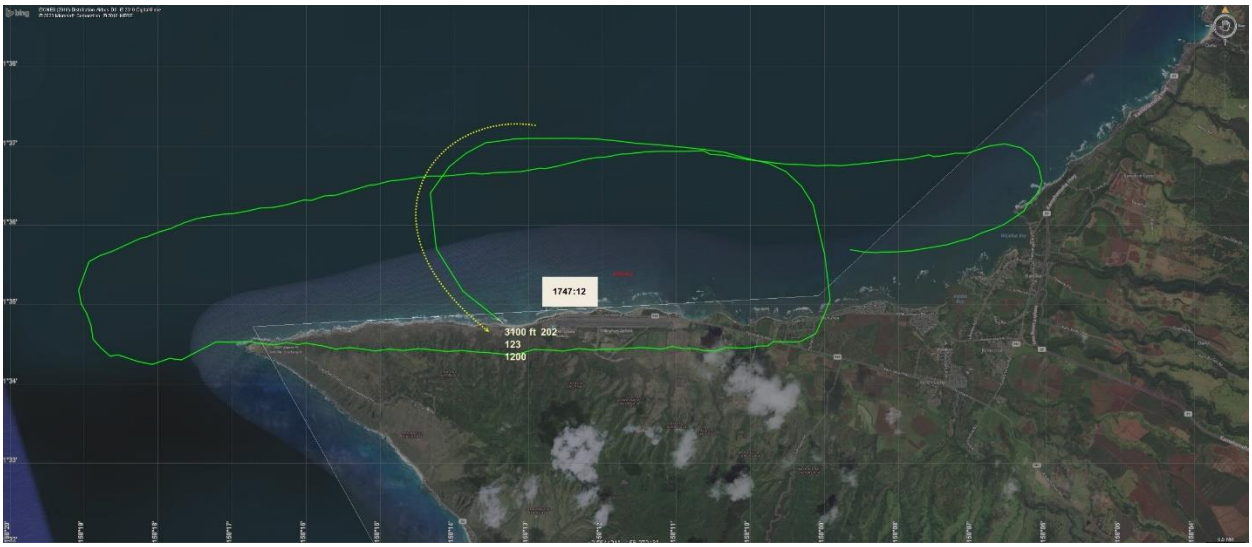

Figure 18: Radar track of last flight off HDH (presumably N256TA) (3).

8.0 Company Information

Photo 3: Photo of the Oahu Parachute Center at Dillingham Airfield.[96]

Oahu Parachute Center (OPC) was a drop zones operator (DZO) located at HDH.[97] According to interviews and evidence, Oahu Parachute Center was started on June 26, 2017 by the owner. Oahu Parachute Center offices with facilities located on the east end of HDH near the drop zone (DZ)

[96] Source: Photo taken by the Operations Group Chairman on June 23, 2019.
[97] There was a total of three DZOs located in close proximity to each on the east end of HDH: Oahu Parachute Center, Sky Dive Hawaii, and Pacific Skydiving Center.

for the parachutists.[98] The owner was a master parachute rigger[99] who had previously been working for several parachute operations at HDH since 1986, including Pacific Skydiving Center (PSC).[100]

After a disagreement with the owner of PSC, the Oahu Parachute Center owner partnered with two other investors and opened Oahu Parachute Center.[101] Oahu Parachute Center had one airplane (N256TA) that was leased from N80896 LLC, whose owner resided in California.[102] According to multiple interviews, Oahu Parachute Center did not operate on Tuesdays to allow for necessary contracted maintenance to be performed on the airplane at a hangar near the departure end of runway 08 at HDH.[103]

According to the owner, Oahu Parachute Center employed only "contract" employees who were paid on a per-flight or as-needed basis.[104] Oahu Parachute Center had five tandem instructors, two cameramen, one video editor, one parachute packer, one manifest person (scheduler), and one pilot (the accident pilot). The accident pilot had a W-9 Internal Revenue Service (IRS) form (dated March 10, 2019), and payments to the accident pilot were made to "Caden LLC" in Miami Beach, Florida.

According to the Oahu Parachute Center owner, they paid their pilot, tandem instructors and cameramen by the "load" (flight). All bookings were conducted either directly or through Fair Harbor,[105] who also handled cancellations and refunds for Oahu Parachute Center.

According to the Hawaii Department of Transportation, Oahu Parachute Center's owner had a permit to rent space at Dillingham Airfield through his parachute packing company "Hawaii Parachute Center LLC" (Revocable Permit No. 6953, dated September 8, 2010). On April 16,

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[98] According to 14 *CFR* 105.3, Drop Zone means any pre-determined area upon which parachutists or objects land after making an intentional parachute jump or drop. The center-point target of a drop zone is expressed in nautical miles from the nearest VOR facility when 30 nautical miles or less; or from the nearest airport, town, or city depicted on the appropriate Coast and Geodetic Survey World Aeronautical Chart or Sectional Aeronautical Chart, when the nearest VOR facility is more than 30 nautical miles from the drop zone.

[99] Title 14 *CFR* 65.111 Certificate required, stated the following, in part: *(a) No person may pack, maintain, or alter any personnel-carrying parachute intended for emergency use in connection with civil aircraft of the United States (including the reserve parachute of a dual parachute system to be used for intentional parachute jumping) unless that person holds an appropriate current certificate and type rating issued under this subpart and complies with §§ 65.127 through 65.133.*

[100] According to FAA records, the owner of Oahu Parachute Center held a Private Pilot certificate that was revoked on May 5, 2011 for violations of 14 *CFR* 61.15(e), which stated the following: *Each person holding a certificate issued under this part shall provide a written report of each motor vehicle action to the FAA, Civil Aviation Security Division (AMC-700), P.O. Box 25810, Oklahoma City, OK 73125, not later than 60 days after the motor vehicle action*), and 14 *CFR* 67.403 (a)(1) (*No person may make or cause to be made a fraudulent or intentionally false statement on any application for a medical certificate or on a request for any Authorization for Special Issuance of a Medical Certificate (Authorization) or Statement of Demonstrated Ability (SODA) under this part).*

[101] Oahu Parachute Center LLC was a limited liability corporation (member-managed), registered with the State of Hawaii Department of Commerce and Consumer Affairs on June 29, 2017 (renewed May 18, 2018 and May 8, 2019). See Attachment 22 - OPC Hawaii Records.

[102] See Attachment 9 - N256TA Lease and Insurance.

[103] According to one former Oahu Parachute Center King Air pilot, the accident airplane was never parked in the hangar, and the maintenance was always done outside.

[104] The NTSB was not provided with any specific "contract" for any Oahu Parachute Center employee other than their respective IRS form W-9.

[105] Fair Harbor was an online activity & tour operator booking software. Source: https://fareharbor.com.

2019, the Hawaii Department of Transportation Airports Division (DOTA) sent a letter to the Oahu Parachute Center owner stating that Oahu Parachute Center LLC was not a registered tenant of the DOTA at Dillingham Airfield (Kawaihapai Airfield) and did not have a permit with the DOTA to conduct skydiving operations. It further stated that Hawaii Parachute Center LLC (HPC) was not in good standing with the Hawaii Department of Commerce and Consumer Affairs (DCCA) due to arrears in the payment of taxes, rents or other obligations. The letter gave HPC until May 15, 2019 to comply with the requirements of their permit with the DOTA.[106]

On June 5, 2019, the DOTA sent Oahu Parachute Center LLC an application for a revocable permit for skydiving operations at Dillingham Airfield (Kawaihapai Airfield). On June 26, 2019, the DOTA sent HPC a letter that stated the company's failure to obtain DOTA consent to operate skydiving activities under Oahu Parachute Center, register its aircraft with the DOTA, and submit a completed application had resulted in the revocation of HPC's Revocable Permit. The letter gave HPC five business days to vacate and remove all personal property at the airfield.[107]

At the time of the accident, Oahu Parachute Center did not have a permit with the Hawaii Department of Transportation Airports Division (the operator of HDH) for parachute operations at Dillingham Airfield.

Title 14 *CFR* 105.23 Parachute operations over or onto airports, stated the following, in part:

> *No person may conduct a parachute operation, and no pilot in command of an aircraft may allow a parachute operation to be conducted from that aircraft, over or onto any airport unless –*
>
> *(b) For airports without an operating control tower, prior approval has been obtained from the management of the airport to conduct parachute operations over or on that airport.*

According to FAA AC105-2E Sport Parachuting, most parachute operations take place at airports, including having the parachute landing area located on the airport property, and stated *"Section 105.23 requires approval from airport management prior to skydiving onto any airport. "*

9.0 Relevant Systems

Beech King Air systems information was found in the Beechcraft King Air A90 Pilot Operating Manual (dated May 27, 1966).[108]

[106] See Attachment 14 - Hawaii DOT Documents.
[107] According to Oahu Parachute Center, as of July 8, 2019 they were aware of the eviction notice from the DOTA and their business was still located at the Airfield as of that date. Source: email sent to the NTSB from the Oahu Parachute Center office manager on Monday, July 8, 2019 7:13 PM.
[108] According to a former Oahu Parachute Center King Air pilot and evidence collected from the accident site, Oahu Parachute Center King Air pilots used the Beechcraft King Air A90 Pilot Operating Manual (dated May 27, 1966) onboard the accident airplane, which contained systems information for the King Air.

9.1 Aileron Trim Tab

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A, dated 2004), page 3-6 and 3-7, an airplane was designed so that the primary flight controls (rudder, aileron, and elevator) were streamlined with the non-movable airplane surfaces when the airplane was cruising straight-and-level at normal weight and loading. If the airplane was flying out of that basic balanced condition, one or more of the control surfaces was going to have to be held out of its streamlined position by continuous control input.

The use of trim tabs relieved the pilot of this requirement. Proper trim technique was a very important and often overlooked basic flying skill. An improperly trimmed airplane required constant control pressures, produced pilot tension and fatigue, distracted the pilot from scanning, and contributed to abrupt and erratic airplane attitude control.

According to the Beech King Air A90 Pilot's Operating Manual, pages 2-8, trim tabs on the rudder, elevator and left aileron were adjustable from the center pedestal through closed circuit cable systems which drove jackscrew-type actuators. Position indicators for each of the trim tabs were integrated with their respective controls. The elevator and aileron tab incorporated anti-servo mechanisms, but the rudder tab has no servo system.

9.2 Stall Warning-Safe Flight Indicator

According to the Beechcraft King Air A90 Pilot Operating Manual (revised February 9, 1977), page A-1, as a stall approached, the stall indicator would flash a red light on the instrument panel. With the gear and flaps down, the indicator was triggered 4 to 8 knots above stall speed by a lift transducer on the left wing leading edge.

10.0 Relevant Procedures

10.1 Oahu Parachute Center Operational Procedures

According to former Oahu Parachute Center pilots, Oahu Parachute Center did not have any set procedures or any manuals for guidance of their jump operations. When the passengers were ready, they were brought to the airplane with the engines running and props feathered, and Oahu Parachute Center personnel would assist in loading the passengers onboard the airplane, and then the airplane would taxi for departure. According to interviews, the Oahu Parachute Center tandem instructors were responsible for briefing the passengers on the use of their seat belts, and the pilot typically did not conduct a passenger briefing after the loading of the airplane or interact with the passengers.

According to interviews, passengers were briefed by the tandem instructors to remain seated with their seat belts fastened until the airplane reached an altitude of 1,500 feet, when passenger parachutists were then instructed to unbuckle their seat belts and passenger parachutists would then connect themselves to the tandem instructor.

Multiple interviews with passengers on past Oahu Parachute Center flights indicated that they did not receive any briefings from the pilot after boarding the airplane. One passenger on the flight

previous to the accident flight said that a briefing from a pilot "would have been uncommon if that would have happened. Typically, there is no general intercom on those planes, and our own safety gear (helmets) would have made it difficult to hear anything coming from the pilot."[109]

Title 14 *CFR* 91.107 Use of safety belts, shoulder harnesses, and child restraint systems, stated the following, in part:

> *(a) Unless otherwise authorized by the Administrator -*
>
> *(1) No pilot may take off a U.S.-registered civil aircraft (except a free balloon that incorporates a basket or gondola, or an airship type certificated before November 2, 1987) unless the pilot in command of that aircraft ensures that each person on board is briefed on how to fasten and unfasten that person's safety belt and, if installed, shoulder harness.*[110]

According to FAA AC 105-2E Sport Parachuting, the PIC was solely responsible for the operational requirements of Parts 91 and 105, including compliance with the special limitations and placards required for flight with the door open or removed. The PIC was also responsible for ensuring that each occupant had been briefed on the operation of his or her restraint system, procedures for ensuring weight and balance stayed within limits while jumpers exit, and procedures to avoid tail strikes.[111]

Title 14 *CFR* 91.107(a)(3)(ii) permitted the use of the floor of the aircraft as a seat, provided that the person was on board for the purpose of engaging in sport parachuting.

FAA Order 8300.10 and 8700.1 Joint Flight Standards Information Bulletin (FSIB) for Airworthiness (FSAW) and General Aviation (FSGA), Bulletin Number FSAW 93-09 and FSGA 93-02 Parachutists Regulatory Status, dated January 25, 1993, stated the following, in part:

> *Federal Aviation Regulations dealing with sport parachute operations were promulgated primarily to ensure protection of other users of the National Airspace System and the general public from sport parachuting activities. Is has been determined that parachute jumping is a sport activity and, as such, should be subject to the FAR's only to the extent necessary to protect others.*
>
> *Aviation safety inspectors (ASIs) having surveillance responsibilities of sport parachute activities should be aware that it is the FAA position that parachutists should not be considered passengers when evaluating the regulatory compliance status of such operations. However, this does not eliminate the requirement for the use of safety belts set forth in FAR 91.107.*[112]

[109] See Attachment 13 - Previous Flight Witness Statements.
[110] Title 14 *CFR* 91.107(a)(3)(ii) permits persons aboard an aircraft for the purpose of participating in sport parachuting activities to use the floor of the aircraft for a seat
[111] For additional information, see Restraint System Factual Report in the docket for this investigation.
[112] See Attachment 15 - FSAW Bulletin 93-09.

Each parachute jumper on the accident airplane was restrained on the benches using a single lift-belt buckle harness, intended to be looped through the lower leg or horizontal back strap of their respective parachute harnesses. The belts were tethered with floor fittings to the pre-existing seat rails on the outboard sides of the benches.[113]

Further, the pilot seat on N256TA had a seat belt and shoulder harness installed. Multiple witness photos showed the accident pilot operating N256TA without his shoulder harness secured during taxi and takeoff.

Title 14 *CFR* 91.105 Flight crewmembers at stations, stated the following:

> *(a) During takeoff and landing, and while en route, each required flight crewmember shall-*
>
> > *(1) Be at the crewmember station unless the absence is necessary to perform duties in connection with the operation of the aircraft or in connection with physiological needs; and*
> >
> > *(2) Keep the safety belt fastened while at the crewmember station.*
>
> *(b) Each required flight crewmember of a U.S.-registered civil aircraft shall, during takeoff and landing, keep his or her shoulder harness fastened while at his or her assigned duty station. This paragraph does not apply if -*
>
> > *(1) The seat at the crewmember's station is not equipped with a shoulder harness; or*
> >
> > *(2) The crewmember would be unable to perform required duties with the shoulder harness fastened.*

10.2 King Air Normal Procedures

Beech King Air Normal Procedures were found in the FAA-approved Beech King Air Model 65-A90 Flight Manual (dated September 25, 1968).[114]

10.2.1 Preflight Check

King Air pre-flight inspection procedures were found in the FAA-approved Beech King Air Model 65-A90 Flight Manual (dated September 25, 1968), page 5-1 and 5-2.[115]

The preflight action required for the left wing included the following:

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[113] For additional information, see Restraint System Factual Report in the docket for this investigation.

[114] According to former Oahu Parachute Center King Air pilots and evidence collected from the accident site, Oahu Parachute Center King Air pilots used the FAA-approved Beechcraft King Air Flight Manual (dated September 25, 1968) onboard the accident airplane, which contained limitations, normal and emergency procedures, and performance information for the King Air.

[115] See Attachment 16 - Beech King Air A90 Normal Procedures.

Aileron and Tab - - Check for left side, and "Aileron - - Check

According to the Systems and Structures Group Chairman's Factual Report, the aileron trim tab knob was found adjusted in the full left wing down position. Further, the left wing trim tab in the left wing was found fully left wing down.[116] This position was consistent with multiple other post-2016 photos of the accident airplane that showed the same left wing down aileron position.

According to one Oahu Parachute Center pilot who trained multiple other pilots in the accident airplane (including the instructor who provided King Air training to the accident pilot), the accident airplane would not fly true straight and level, and always wanted to bank to the left. It required full maximum aileron trim to keep it straight and level. He said the aircraft owner was aware of this issue, and told him it had something to do with the left wing being bent.

The pilot who test flew the airplane after the 2017 repairs on the horizontal stabilizer, and the pilot who ferried the accident airplane over from the U.S. to Hawaii in 2017, both could not recall the airplane needing additional aileron trim.

Inflight photos during the 2017 delivery showed the aileron trim tab deflected, along with non-smooth skin transition aft of the outboard spar and wrinkles on the upper wing skin. Additional post-2016 witness photos showed the airplane operating at HDH with the left aileron trim tab position clearly in the full left wing down position.[117]

[116] See Systems and Structures Group Chairman's Factual Report.

[117] For additional information on the history of the accident airplane (N256TA), see Systems and Structures Group Chairman's Factual Report.

Photo 4: Inflight photo of N256TA during 2017 delivery to Hawaii. The red arrow shows the aileron trim tab deflection.[118]

[118] Source: Provided to the NTSB by the pilot who ferried the accident airplane from North Las Vegas to Hawaii in 2017. See Attachment 2 – Records of Conversation.

Photo 5: Witness-provided photo of N256TA at HDH showing aileron trim tab in a trailing edge down position, indicated by the red arrow. Date of photo is unknown.

Photo 6: Witness-provided photo of N256TA at HDH dated June 16, 2019.

Photo 7: Enlargement of previous photo showing aileron trim tab in a trailing edge down position, indicated by the red arrow.

Photo 8: Photo of N256TA Aileron trim, indicated by red circle. Photo shows aileron trim knob indicating full left wing down orientation.[119]

[119] Source: Former part-time Oahu Parachute Center King Air pilot, dated November 2018.

10.2.2 Takeoff Procedures

The normal King Air Before-takeoff and Takeoff procedures were found in the FAA-approved Beech King Air Model 65-A90 Flight Manual (revised February 13, 1977). The Before Takeoff checklist included a manual check of the propeller feathering system.[120]

For takeoff, the Flight Manual, page 5-5 stated the following, in part:

> *Check ITT and engine torque readings while applying power. Remember that increased airspeed will cause torque and ITT to increase. Accelerate to 91 knots before rotating, and then to 100 knots before climb. Retract the landing gear before reaching 130 knots.*[121]

According to an Oahu Parachute Center King Air pilot, they would typically take off with no flaps, and used 1,000 pounds of the torque on each engine for their power settings. They would rotate the airplane about 97 knots. With a positive rate of climb they would retract the landing gear and they would target a climb speed of about 110 to 115 knots.

At 1,000 feet altitude, the propellers would be set to 2,000 revolutions per minute (rpms) until they reached an altitude of 14,000 feet. The pilot would then level off and broadcast a five minute call on the Unicom to warn of the jump run and advise that the jumpers were five minutes from exiting the airplane.

The pilot would then set 300-400 pounds of torque, propellers would be set to 50%, and they would slow the airplane to about 90 knots. The pilot would then hit the green light button and then the jumpers would exit the airplane.

The pilot would then adjust the pitch of the propellers, pitch the airplane down and descend at 185 knots (staying below the maximum redline speed on the airspeed indicator) to help save the engines. The Oahu Parachute Center King Air pilot said that the airplane's owner did not want pilots to descend at flight idle on the throttles to help save the engines.

10.3 King Air Emergency Procedures

The King Air Emergency Procedures were located in the FAA-approved Beech King Air Model 65-A90 Flight Manual (dated September 25, 1968).

10.3.1 King Air Single-Engine Procedures

The Flight Manual stated that for engine failures below 100 knots, the pilot should reduce power to idle and apply the brakes as required. If insufficient runway remained, the pilot should place the condition levers to cut-off, close the firewall valves, and turn the electrical power and boost pumps off.

---

[120] See Attachment 16 - Beech A90 Normal Procedures. The accident airplane did not have an auto-feathering system for the propellers.

[121] According to the onsite wreckage examination, the landing gear was found in the retracted position. See Systems and Structures Group Chairman's Factual Report in the docket for this investigation.

If the airplane became airborne and experienced an engine failure that would preclude an immediate landing, the following procedures were to be followed:

a. Power - AS REQUIRED
b. Propeller RPM - FULL INCREASE
c. Landing Gear - UP
d. Flaps - UP
e. Confirm dead engine
f. Propeller (inoperative engine) - FEATHER
g. Clean-Up (Dead Engine):
   (1) Condition Lever - CUT–OFF
   (2) Auto-ignition - OFF
   (3) Fuel Firewall Valve - CLOSED
   (4) Fuel Boost Pump - OFF
   (5) Fuel Transfer Pump - OFF
   (6) Crossfeed - CLOSED
   (7) Generator - OFF
   (8) Supercharger Firewall Valve - AS REQUIRED
   (9) Propeller Sync. - OFF
   (10) Fuel Control Heat - OFF
   (11) Electrical Load - MONITOR

CAUTION

If smoke or fumes are entering the cabin from the left engine, close the Supercharger Firewall Valve.

Figure 19: Beech King Air Single-engine procedures.[122]

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A dated 2004), a takeoff or go-around was the most critical time to suffer an engine failure. The airplane would be slow, close to the ground, and might even have the landing gear and flaps extended. Altitude and time would be minimal. Until feathered, the propeller of the failed engine would be windmilling, producing a great deal of drag and yawing tendency. Airplane climb performance would be marginal or even non-existent, and obstructions might lie ahead. Add the element of surprise and the need for a plan of action before every takeoff was obvious.

11.0 Performance

11.1 Minimum Controllable Airspeed

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A, dated 2004), V_{MC} was the minimum control speed with the critical engine inoperative. It was the minimum speed at which directional control could be maintained under a very specific set of circumstances outlined in 14 *CFR* Part 23, Airworthiness Standards.

V_{MC} increased as the center of gravity was moved aft. The moment arm of the rudder was reduced, and therefore its effectivity was reduced, as the center of gravity was moved aft. At the same time,

[122] Beech Model 65-A90 FAA Flight Manual (dated September 25, 1968), page 6-1. Note: The accident airplane did not have an auto-feather system. For additional information, see Attachment 17 - Beech A90 Emergency Procedures.

the moment arm of the propeller blade was increased, aggravating asymmetrical thrust. Invariably, the aft-most CG limit was the most unfavorable CG position, Title 14 *CFR* Part 23 called for the VMC to be determined at the most unfavorable weight. For twin-engine aircraft certified under 14 *CFR* Part 23, the weight at which VMC was determined was not specified. VMC increased as weight is reduced.

According to the Beech Model 65-A90 Pilot Operating Manual, the VMC for the King Air was 91 knots.

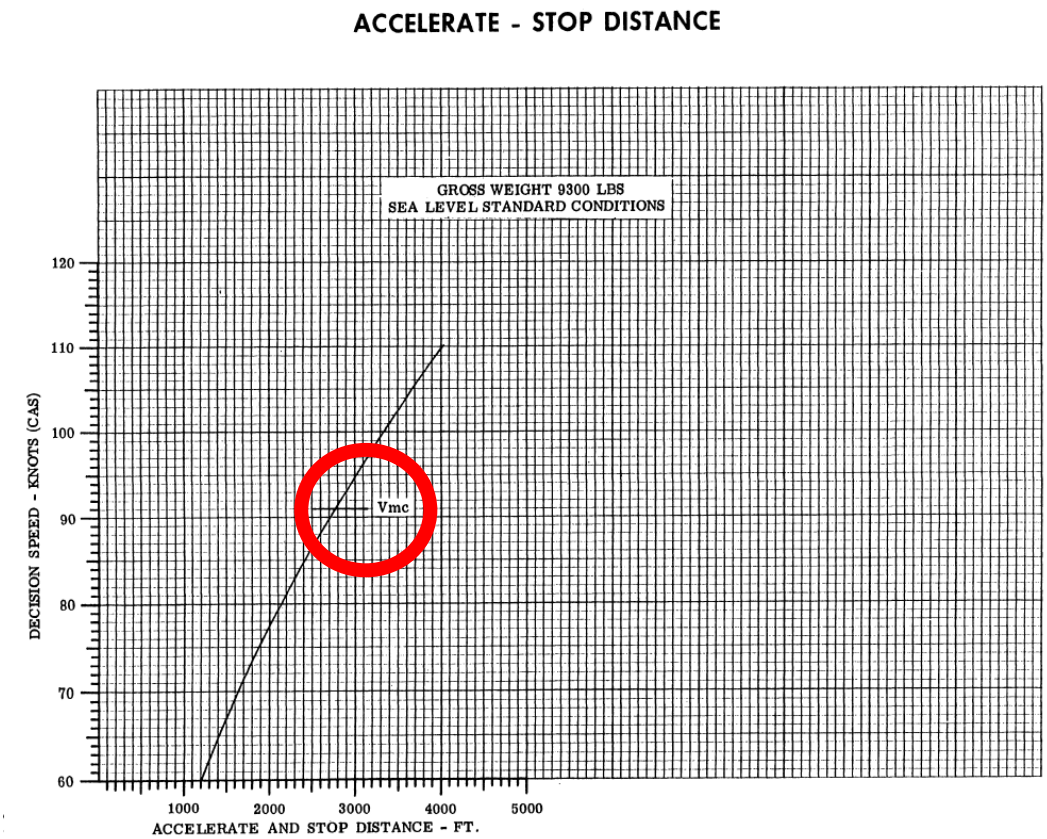

Figure 20: Beech A90 Accelerate – Stop Distance performance chart showing 91 knots VMC (indicated by red circle).[123]

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A, dated 2004), VMC was typically marked with a red radial line on most airspeed indicators. There was no red radial on the accident airplane's airspeed indicator

[123] Source: Beech Model 65-A90 Pilot Operating Manual, page 8-5.

Photo 9: Close-up photo taken by a former Oahu Parachute Center pilot, showing the airspeed indicator on the accident airplane.

11.2 Stall Speed

According to the FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), angle of attack (AOA) was the angle between a plane's wing and the oncoming air. If the AOA became too great, the wing could stall and lose lift. Any aircraft, within the limits of its structure, may be stalled at any airspeed. When a sufficiently high AOA is imposed, the smooth flow of air over an airfoil breaks up and separates, producing an abrupt change of characteristics and a sudden loss of lift, which resulted in a stall. If a pilot failed to recognize and correct the situation, a stall could lead to loss of control and loss of altitude.

VS was the stall speed of the airplane.[124] Should a stall occur while the airplane was under asymmetrical power, particularly high asymmetrical power, a spin entry was likely. The yawing moment induced from asymmetrical thrust was little different from that inducted by full rudder in an intentional spin in the appropriate model of a single-engine airplane. In this case, however, the airplane would depart controlled flight in the direction of the idle engine, not in the direction of the applied rudder. Twin-engine aircraft were not required to demonstrate recoveries from spins, and their spin recovery characteristics were generally very poor.

Where VS was encountered at or before VMC, the departure from controlled flight may be quite sudden, with strong yawing and rolling tendencies to the inverted position, and a spin entry.[125]

[124] See Attachment 19 - Beech A90 Stall Speeds.
[125] For additional information, see Performance Study, Systems and Structures Group Chairman's Factual Report and Powerplants Group Chairman's Factual report in the docket for this investigation.

According to the FAA Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), Chapter 4, recovery from a stall in any aircraft becomes progressively more difficult as its CG moves aft. An aircraft loaded to the rear limit of its permissible CG range handled differently in turns and stall maneuvers and has different landing characteristics than when it was loaded near the forward limit.

In addition, the aircraft becomes less stable as the CG is moved rearward, which decreased the ability of the aircraft to right itself after maneuvering or turbulence. This was because when the CG was moved rearward it caused an increase in the AOA. Therefore, the wing contribution to the aircraft's stability was decreased, while the tail contribution was still stabilizing. When the point was reached that the wing and tail contributions balanced, then neutral stability existed. Any CG movement further aft resulted in an unstable aircraft.

11.3 Beech A90 Stall Speeds

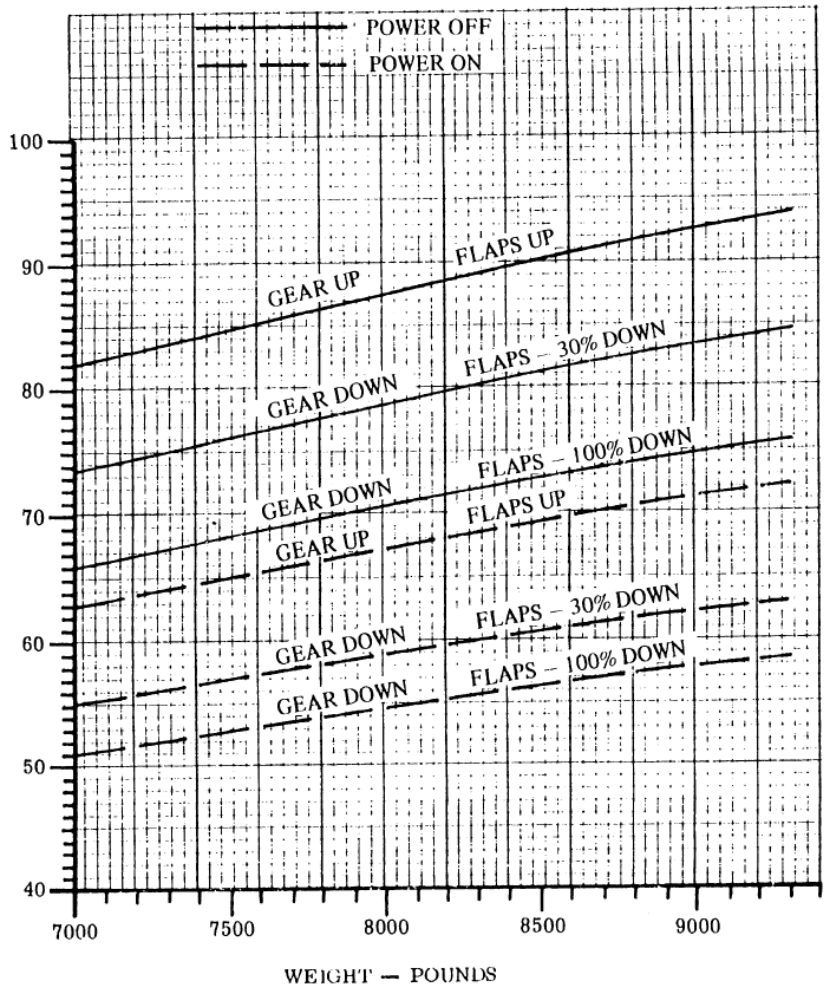

Figure 21: Beech A90 Stall Speed Chart.[126]

[126] Source: Beech Model 65-A90 FAA Flight Manual (revised February 13, 1977), page 7-24.

11.3.1 Accelerated Stalls

According to the FAA Airplane Flying Handbook (FAA-H-8083-3A, dated 2004), page 4-9, at the same gross weight, airplane configuration, and power setting, a given airplane will consistently stall at the same indicated airspeed if no acceleration is involved. The airplane will, however, stall at a higher indicated airspeed when excessive maneuvering loads were imposed by steep turns, pull-ups, or other abrupt changes in its flightpath. Stalls entered from such flight situations were called "accelerated maneuver stall," a term which had no reference to the airspeeds involved.

Stalls which result from abrupt maneuvers tended to be more rapid, or severe, than unaccelerated stalls, and because they occur at higher-than-normal airspeeds, and/or may occur at lower than anticipated pitch attitudes, they may be unexpected by an inexperienced pilot. Failure to take immediate steps toward recovery when an accelerated stall occurred may result in a complete loss of flight control, notably power-on spins.

An accelerated stall may be encountered any time excessive back-elevator pressure was applied and/or angle of attack is increased too rapidly.[127]

12.0 Title 14 *CFR* 119.1 Exception

Title 14 *CFR* 119.1 addressed the applicability of certification requirements for air carriers and commercial operators. As a general rule, aircraft operators conducting commercial operations must be certificated under Part 119 prior to engaging in transportation of passengers or property for compensation or hire, and hold an air operator certificate issued by the FAA and operate under Parts 121, 125, or 135. [128]

However, 14 *CFR* 119.1(e)(6) excepts nonstop flights conducted within a 25-statute-mile radius of the airport of takeoff carrying persons or objects for the purpose of conducting intentional parachute operations. Drop Zone parachute operators (like Oahu Parachute Center) were not required to have an air operator certificate, per exception 14 *CFR* 119.1(e)(6).

13.0 FAA Oversight

FAA oversight of Drop Zone parachute operations at HDH was conducted by the closest FAA Flight Standards District Office (FSDO), which was located at the Daniel K Inouye International Airport (HNL), Honolulu, Hawaii.

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[127] Source: FAA Airplane Flying Handbook (FAA-H-8083-3A, dated 2004), page 4-10.

[128] Title 14 *CFR* Part 1 defined "commercial operator" as *a person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier or foreign air carrier or under the authority of Part 375 of this title. Where it is doubtful that an operation is for "compensation or hire", the test applied is whether the carriage by air is merely incidental to the person's other business or is, in itself, a major enterprise for profit.*

13.1 FAA Inspections of Oahu Parachute Center

Title 14 *CFR* 105.9 "Inspections" stated that the FAA may inspect any parachute operation to which this part applies (including inspections at the site where the parachute operation was being conducted) to determine compliance with the regulations of this part (14 *CFR* 105).

When asked to discuss the types of surveillance activities required by the FAA for parachute and drop zone operations, the HNL FSDO inspector who conducted an inspection of Oahu Parachute Center said the requirements were not that extensive, and they would just go out and check the operations, ensure the aircraft had its registration and airworthiness certificate along with other basic requirements, the aircraft was properly configured with seat belts, and they would check the pilot's certificates and medical.

According to FAA Order 1800.56T "National Flight Standards Work Program Guidelines" (effective 7/31/2019), inspector guidance applied to Part 91 parachute operations conducted in accordance with 14 *CFR* Part 105. Inspector guidance included yearly inspections[129] on each parachute operation/Drop Zone (DZ) located within the responsible Flight Standards office's jurisdiction, to include the following inspections:[130]

(a) Ramp (PTRS code 1661).
(b) Ramp (PTRS codes 3627 or 5627).
(c) Parachute Jumps (PTRS code 1696).
(d) Spot (PTRS code 3681 or 5681).
(e) Aircraft Records (PTRS code 3694 or 5694).
(f) Title 14 CFR Part 65 Rigger (senior or master) (PTRS code3678).

On March 7, 2018, an FAA operations inspector from the HNL FSDO conducted a 1696 (Parachute Jumps) inspection and a 1661 (Ramp) inspection of Oahu Parachute Center.[131] According to FAA records, the inspection included an observation of sport parachute operations, and included a spot check of two tandem rigs for current reserve packing dates, and a ramp inspection of the aircraft and pilot.[132]

According to the inspector who conducted the inspections (1696 and 1661), for the jump inspection he watched the parachute jumps and when the divers were out, observed for cloud clearance requirements. When the jumpers were back on the ground, he checked a few of the jumpers for packing requirements. He recalled seeing the takeoff, and observed the jump and the landings. He did not recall if he saw the pilot conduct a weight and balance before the flight. He did not

[129] Source: FAA Order 1800.56T "National Flight Standards Work Program Guidelines," dated July 31, 2019.
[130] FAA inspector guidance for inspections of sport parachute operations was defined in FAA 8900.1 (CHG 383), Volume 6, Chapter 11, Section 5 "Surveillance of Sport Parachute Activities." See Attachment 20 - FAA Surveillance of Sport Parachute Activities.
[131] The FAA operations inspector was alone on the March 7, 2018 inspection of Oahu Parachute Center, and was not accompanied by an FAA maintenance inspector. A review of records provided by the FAA found no other operations-related FAA surveillance activities associated with Oahu Parachute Center.
[132] When asked if there was there anything specific to trigger the March 7, 2018 inspections of Oahu Parachute Center, the FAA operations inspector said it just showed up in his work program to accomplish a ramp and jump inspection on the operator, and it ended up as part of his normal work plan. The Oahu Parachute Center (and the accident aircraft) were entered into the FAA Enhanced Vital Information Database (eVID) on December 7, 2017.

recall if he saw the aircraft logbook, but did look at the flight manuals and they appeared to be current. He did remember seeing the pilot's certificate and medical, but did not look at the pilot's flight logbook.[133]

The FAA operations inspector also said the ramp inspection included an aircraft check and basic ramp inspection on the aircraft (N256TA), along with a check of the pilot certificate and medical. He also conducted a walk-around of the aircraft, and according to FAA records, no issues were noted. According to the Oahu Parachute Center King Air pilot involved in the ramp inspection, the March 7, 2018 inspection was more of a paperwork inspection and no real physical inspection of the operation.

The FAA operations inspector said he did not know of any complaints regarding the accident airplane, had not heard of issues regarding the aircraft from the FAA maintenance inspector, and was unaware that N256TA had been involved in a previous accident.[134]

14.0 United States Parachute Association (USPA)

According to FAA AC 105-2E Sport Parachuting, sport parachuting had certain inherent risks for all participants. The FAA encouraged sport parachutists to complete formal training courses offered by national recognized organizations that had equivalent training programs.

The United States Parachute Association (USPA) was an FAA-accepted, nationally recognized skydiving organization that licensed skydivers in the United States.[135] Many local skydiving clubs, schools, and drop zones operators (DZO) required documentation of experience and competency before using their equipment and/or parachuting facilities. According to the USPA, the Oahu Parachute Center owner had been a member of USPA since March 1990.[136]

The USPA developed basic safety requirements (BSRs) and information for skydiving activities. These requirements and information were for training, checking equipment, and conducting a wide variety of sport parachuting activities. While not approved by the FAA, the BSRs were considered industry best practices and were widely accepted for use by individuals and parachute centers.

As part of the FAA's Aviation Safety Program, which provided publications to the aviation community that included safety information summarized in various FAA advisory circulars,

[133] See Attachment 1 - Interview Summaries.

[134] A review of records provided by the FAA showed that on December 7, 2017, an FAA airworthiness inspector from the HNL FSDO conducted a 3627 ramp inspection on N256TA. The report listed the inspection as "satisfactory," and provided no additional comments. For additional information, see Maintenance Records Group Chairman's Factual Report in the docket for this investigation.

[135] The USPA is a voluntary organization made up of about 41,000 individual members and about 212 operator members, referred to as "group members" or "drop zone" members, and 103 Foreign Affiliates. The USPA's mission is to support and promote safe skydiving through parachuting training, rating, and competition programs, and it distributes safety information through printed publications and its website. USPA issues four skydiving licenses, A through D, indicating progressive levels of skill and accomplishment. USPA licenses remain current with membership and are recognized by the Federation Aeronautique Internationale. A skydiver is considered a student until issued a license.

[136] Source: Email to the NTSB from the USPA Director of Government Relations, Thursday, May 28, 2020 2:47 PM. The accident pilot was not a member of USPA.

handbooks, and other publications, the FAA and USPA collaborated to create "Flying for Skydive Operations – P- 8740-62" to describe specific flight operations and safety considerations that were needed when flying skydivers.[137]

15.0 NTSB Special Investigative Report SIR-08/01

Adopted on September 16, 2008, NTSB Special Investigative Report (SIR) 08/01 described the results of an NTSB review of 32 accident that involved parachute jump (or "skydiving") operations that occurred between 1980 and 2008. As a result of this investigation, the Safety Board issued six (6) safety recommendations to the FAA and two (2) to the USPA.[138]

F. ATTACHMENTS

Attachment 1 – Interview Summaries
Attachment 2 – Records of Conversation
Attachment 3 - Pilot Information
Attachment 4 - Pilot's OPC Training Record
Attachment 5 - NTSB Letter and Subpoena to Pilot's Instructor
Attachment 6 – Pilot Logbook
Attachment 7 - Advisory Circular 105-2E
Attachment 8 - N256TA FAA Records
Attachment 9 - N256TA Lease and Insurance
Attachment 10 - Beech A90 Door-removed Procedures
Attachment 11 - Weight and Balance
Attachment 12 - Dillingham Airfield FAA Information
Attachment 13 - Previous Flight Witness Statements
Attachment 14 - Hawaii DOT Documents
Attachment 15 - FSAW Bulletin 93-09
Attachment 16 - Beech A90 Normal Procedures
Attachment 17 - Beech A90 Emergency Procedures
Attachment 18 - Beech A90 Engine Limitations
Attachment 19 - Beech A90 Stall Speeds
Attachment 20 - FAA Surveillance of Sport Parachute Activities
Attachment 21 - Evidence Control Forms
Attachment 22 - OPC Hawaii Records
Attachment 23 - Flying for Skydive Operations – P- 8740-62
Attachment 24 – FAA Legal Interpretations

Submitted by:
Captain David Lawrence
NTSB, AS-30

[137] See Attachment 23 - Flying for Skydive Operations – P- 8740-62.
[138] To review NTSB SIR-08/01, go to https://www.ntsb.gov/safety/safety-studies/Pages/SIR0801.aspx.

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