

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: March 5, 1956

Released: March 9, 1956

BEECH BONANZA, N 5825C, NORTH HOLLYWOOD, CALIFORNIA,
OCTOBER 17, 1955

The Accident

At 2214^{1/} on October 17, 1955, a Beech Bonanza, Model C-35, N 5825C, piloted by Joel W. Thorne, crashed into an apartment building located at 11948 Magnolia Boulevard, North Hollywood, California. Eight residents of the building and the pilot were fatally injured; one resident was seriously injured. The building received major damage and the aircraft was destroyed by impact and the fire which followed.

History of the Flight

At approximately 2100 October 17, Pilot Joel Thorne telephoned the Burbank CAA Airways Communications Station and filed a DVFR (Defense Visual Flight Rules) flight plan from the Lockheed Air Terminal, Burbank, California, to McCarran Field, Las Vegas, Nevada. The flight plan specified a proposed routing over Airways Amber 1 to Newhall, Green 4 to Palmdale and Daggett, and Amber 2 to Las Vegas. Pilot Thorne estimated he would depart at 2115 with no passengers and the flight would require approximately one hour and 40 minutes. He also indicated his aircraft, a Beech Bonanza, N 5825C (referred to as N 25C), had sufficient fuel for four hours of flight. At this time and for about two hours thereafter the Lockheed Air Terminal weather conditions were reported as: Ceiling 700 feet overcast; visibility 2 miles, smoke and haze; top of the overcast reported variable 2,500 to 3,000 feet m. s. l. (mean sea level) or 1,800 to 2,300 feet above the ground. In conversation with a pilot who had just landed Mr. Thorne was advised of these conditions.

At 2159 Pilot Thorne radioed the Burbank Tower (located at the Lockheed Air Terminal) from N 25C and asked for taxi and takeoff instructions. In response the tower local controller cleared the flight to runway 15 (150 degrees magnetic) and gave the latest wind and altimeter information. When asked if he was IFR (Instrument Flight Rules) or just a climb to on top Mr. Thorne replied he just wanted a clearance to climb westbound to on top. The controller then transmitted, "N 5825C, Burbank Tower, you can have a southeast reversal immediately, or a six-minute delay for a 260 degree departure." Pilot Thorne elected the latter. At 2208 the controller cleared the flight as follows: "Bonanza 25C taxi into position and hold. Your climb out after takeoff, make right turn, climb on magnetic heading of 260 degrees to on top, report on top." This was acknowledged by Mr. Thorne. The takeoff appeared normal to the tower

^{1/} All times herein are Pacific standard and are based on the 24-hour clock.

personnel and they noted the navigation and two anticollision lights (Grimes lights) on the Bonanza were on throughout this time. The Bonanza was last observed from the tower turning right and climbing toward the overcast. There were no other radio contacts with the flight.

Shortly thereafter the Burbank controllers received several telephone calls from residents south and southwest of the airport. They reported an aircraft in that area was flying very low and appeared to be in trouble or stunting. At 2214 an aircraft, later identified as N 5825C, crashed into an apartment building 4.3 miles southwest of the airport.

Investigation

Many ground witnesses located south and southwest of the airport saw and/or heard N 25C in flight before it crashed into the apartment building. A representative group of these witnesses testified at the Board's public hearing concerning their observations and many others furnished formal statements during the investigation. From this source of information the probable flight path of the aircraft was reconstructed as accurately as possible and is shown as attachment A.

The first of these witnesses, an aircraft mechanic employed at the airport, was located on Riverton Avenue near Victory Boulevard. Interested in the anticollision lights, which he had observed being relocated on N 25C during the day, he went outside of his home to see them when he recognized the sound of a light aircraft engine and thought it might be Mr. Thorne taking off. The witness saw N 25C immediately after takeoff as it turned right to an approximate heading of 260 degrees. On this heading it continued to climb and entered the overcast over the vicinity of Victory and Vineland Boulevards. Shortly thereafter the witness heard the engine sound get louder and in a manner which gave him the impression the aircraft was turning left and descending rapidly. The Bonanza was then seen to emerge from the overcast at very high speed, diving steeply and turning left. The nose of the aircraft jerked up sharply while the turn continued through north to a west heading, completing one 360 degree turn from the first observed direction. The aircraft again disappeared into the overcast, climbing steeply. This witness, because of his interest in the anticollision lights, stated positively that they were on while he could see the aircraft. The witness continued to hear the aircraft but could not see it again.

The second witness, a pilot, was located west of the first. He stated that N 25C was observed to pass closely over his position three times while it flew a circular path, approximately one-half mile in diameter, bounded by Victory Boulevard on the north, Cahuenga on the east, Tujunga on the west and, although beyond his vision, probably Magnolia on the South. During this time he observed the aircraft climb into and dive out of the overcast several times. He stated these erratic movements seemed to indicate the pilot was having difficulty with lateral and longitudinal control. This witness, in agreement with the first, thought the engine sound increased and decreased with vertical oscillations of the aircraft. The engine sounded as though it were operating with an appreciably high power setting and with its propeller in fairly low pitch. The engine sound, however, was uninterrupted and did not indicate any

malfunction. This witness observed that the navigation lights were on but said the anticollision lights were off. No witnesses after the first observed the latter lights to be on. When the Bonanza passed the witness the third time it assumed a westerly heading and again climbed into the overcast.

Next to see the Thorne aircraft were several witnesses located more than one mile southwest of the first two, and slightly less than one mile north-northeast of the accident site. They also described the rising and falling engine and propeller noise, and those who saw the flight observed it go in and out of the overcast. One witness, with dive bomber experience, said the sound was unmistakably that of an aircraft diving and pulling up. In this area the Bonanza again flew at least one complete 360-degree circular path.

Witnesses in the immediate accident area who saw the crash stated that just prior to the accident the aircraft dived out of the overcast at an estimated 65-75-degree angle on a southeast heading but turning rapidly to its right. It pulled up sharply when it reached a southwest heading at which time several large components separated from the main aircraft structure. Rolling violently to the right the major structure plunged into the apartment roof. An explosion and intense fuel fire followed.

Nearly all witnesses were in agreement that weather conditions observed along the flight path of N 25C corresponded with those reported at the Lockheed Air Terminal. Many stated the overcast was without breaks and fairly smooth along the bottom. Several stated this ceiling was at least 700 feet above the ground and visibility at least two miles with little variability.

The aircraft structure available for examination was greatly limited, major portions of fuselage, left wing, and cockpit having either been consumed by fire or burned nearly beyond recognition. However, major portions of the right wing, right flap and aileron, together with the empennage were found at varying distances up to several hundred yards northeast of the main wreckage site. This was confirmation that the aircraft had sustained an inflight failure of its basic structure.

The right wing was relatively intact and had received only moderate impact damage. The primary failure of this wing occurred just outboard of the wing-to-center section attachment in upward or positive bending as a result of loads in excess of the strength of the structure. Chord-wise compression buckles were evident on the upper wing surface outboard of the primary fractures. In addition numerous diagonal wrinkles were found on both the upper and lower surfaces of this wing. The type and direction indicated they were produced by a high nose-down torsional load on the wing box structure.

As indicated, the right aileron and a major portion of the right flap separated in flight. Evidence clearly showed they were torn from the wing by forces in excess of their strength. The twin inboard flap hinge ribs had been torn from the flap but remained in place in the wing. These were found jammed in the flap's retracted position. This flap position was further verified by comparing the flap drive screw extension of N 25C with that of another Bonanza with flaps retracted. The right aileron failed and separated in three sections. Evidence showed that before separation the aileron had been positioned well past its normal down travel.

The left and right tail sections showed no evidence of fire or that they had been struck by any other component of the aircraft. The primary inflight failures of both occurred at the spar-to-fuselage attachment. Both failures were similar except the right section failed upward under positive loads while the left failed downward under negative force. These failures indicated violent right rotation of the aircraft along its longitudinal axis following the right wing separation.

The right main landing gear was found relatively undamaged in the fully retracted position. This, together with the position of the landing gear drive mechanism, showed that the landing gear was retracted at the time of the accident.

Numerous metal samples from the available structure were examined by metallurgists under laboratory conditions. Results of this examination disclosed that the material was within the specification limits and there was no evidence of fatigue failure.

The Beech model C-35 is type certificated under the "Utility Category" strength requirements of Part 3 of the Civil Air Regulations, and the approved operating limitations for this model are set forth in Aircraft Specification No. 777, issued by the Civil Aeronautics Administration. Since an inflight structural failure of the airframe had occurred in this accident, a review of the design data was made by Board investigators. This review showed that the structural design met, and in many instances exceeded, the minimum strength requirements of Part 3. It also showed the adequacy of the design was thoroughly verified by extensive laboratory testing. Because the wing failure of N 25C appeared to have resulted from a rolling pullout type of loading, the Board requested the airframe manufacturer to provide data on the airframe strength for this maneuver. The manufacturer's report, submitted as an exhibit at the public hearing, indicates that the wing design incorporated strength for an ultimate load factor of from 5.25 to 5.80 g's, as compared with required minimum strength of 4.4 g's.

The engine, a Continental model E-225-8, received major damage at impact and from the intense fire which followed. The engine was disassembled and examined in detail to determine whether or not its malfunction or failure was a factor in the accident. The reciprocating assemblies, drive gears, bearings, and bushings were intact and did not show evidence of operating distress. The cylinder assemblies indicated no combustion chamber difficulties. As a result of this investigation there was no evidence found to indicate that there was a malfunction or failure of the aircraft powerplant.

The propeller installed on N 25C was a Beech model 215-109. Both blades were bent rearward with considerable amounts of each outboard end melted away by the fire. The pitch-changing mechanism and motor were intact with the motor still attached to the propeller ring gear. A measurement of the pitch-changing motor pinion gear from the low pitch stop revealed the propeller blades were positioned about 18 degrees. This position at cruise climb would maintain 130-140 miles per hour. There was no evidence of malfunction or failure of these components.

The official airman records of the CAA showed that Mr. Thorne began his flying career in 1933 and received a private pilot certificate in 1935. Thereafter, on January 13, 1938, he was issued a commercial pilot certificate at which time he had 459 flying hours. He applied for and was reissued a commercial pilot certificate on February 13, 1953. The application for this certificate submitted by Mr. Thorne listed his total flying time as 3,300 hours. On June 30, 1955, he applied for a medical certificate and listed his total flying hours as 3,800. He also showed that of this time 800 hours were actual instrument, 45 were hooded instrument flight, and 45 were simulated instrument. He listed 600 hours of the 3,800 as flown at night and 60 as accumulated within the preceding 12 months. The records disclosed that Mr. Thorne did not hold an instrument rating. Pursuant to the medical application Mr. Thorne was examined and issued a valid second-class medical certificate dated June 30, 1955. The terms of the certificate required him to wear minor corrective lenses while flying; there were no other waivers. Board investigators were unable to find any substantiating personal records to the above-listed flying experience and were informed that Mr. Thorne kept no personal logs.

During the accident investigation it was learned from California public records that Mr. Thorne had been arrested 90 separate times for highway traffic violations and that 36 of them were for speeding. During a 12-year period he was involved in six reportable automobile accidents, one of which resulted in a fatality and another in personal injury. For some period before 1951 he was placed on probation and in October of that year his driving privileges were revoked by court action. As a result of this action his Nevada driver's license was also revoked. Evidence indicated he thereafter obtained Arizona and Michigan driver's licenses and drove an automobile in California and Nevada on at least one known occasion.

At the time of the accident the CAA was in the process of filing a violation report against Mr. Thorne for flying without an instrument rating under conditions and circumstances requiring one.^{2/} The first incident on

^{2/} "60.12 Careless or reckless operation. No person shall operate an aircraft in a careless or reckless manner so as to endanger the life or property of others."

"60.31 Visibility

(b) Flight visibility within control zones. When the flight visibility is less than 3 miles, no person shall operate an aircraft in flight within a control zone, unless an air traffic clearance is obtained from air traffic control;

(c) Flight visibility within control areas. When the flight visibility is less than 3 miles, no person shall operate an aircraft within a control area;

NOTE: When the flight visibility is less than 3 miles, operations within control areas are to be conducted in accordance with instrument flight rules. Flight below 700 feet above the surface is not within a control area."

"43.65 Instrument flight limitations. A pilot shall not pilot aircraft under instrument flight rules, unless he holds a valid instrument rating issued by the Administrator."

which the violation was based occurred October 10, 1955, when Pilot Thorne was flying N 25C from Fullerton Airport, Fullerton, California, to the Orange County Airport, California. During the flight he climbed without a clearance through the overcast and upon reaching the Long Beach area, and still flying above the overcast, decided to land at the Long Beach Airport. He was given an instrument procedure clearance to descend, however, then exhibited extreme difficulty in understanding it. The Long Beach controller explained the procedure to him in exacting detail but he still showed extreme difficulty in carrying it out. Because of this, traffic in the area was delayed 45 minutes.

While the October 10 incident was under further investigation a second series of complaints against Mr. Thorne was submitted to the CAA. It was learned that on October 7 and 8, 1955, Mr. Thorne took off from the Fullerton Airport without clearance when the visibility was one mile or less and climbed through an overcast to above the clouds. This information was obtained while Fullerton officials were investigating the source of several extremely low flights (buzzing) over the city by an aircraft without lights. The latter investigation revealed these incidents occurred when only Thorne had taken off from the airport. An official of the airport testified that Mr. Thorne had previously been reprimanded for unreasonably fast taxiing and as a result of the "buzzing" had been requested to base his aircraft elsewhere. It was while moving his aircraft to Orange County that the October 10 incident took place.

On October 11 Mr. Thorne voluntarily came to the CAA offices at Long Beach and readily admitted the incidents. At this time he stated that he held no instrument rating but showed he was familiar with the regulations applicable to the aforementioned flights. These requirements were further amplified during the conversation. He was also advised, at this time, to terminate such instrument flights until he demonstrated capability and was certificated for them. He was told to take immediate steps to this end. Mr. Thorne was further advised that violation charges would be processed and filed against him for the aforementioned incidents. During the conversation Mr. Thorne impressed the CAA Safety Agent as primarily concerned with the loss of his flying privileges which he used regularly when traveling between Las Vegas, his residence, and Los Angeles. The violation report was prepared and on October 17 it was forwarded for action.

Mr. Thorne purchased N 5825C on June 10, 1955. The aircraft was fully equipped at this time with instrumentation and appliances for instrument flight. This included a full instrument panel, ILS (Instrument Landing System) equipment, Lear L-2 auto-pilot with approach coupler, Lear ADF-12, several radio transmitters and receivers, both low frequency and VHF (Very High Frequency). The aircraft generator supplying electrical power was a Delco-Remy 50 ampere, model 1101888. The aircraft was also fully equipped for night flying. Because of the complete destruction of the aircraft few instruments were available for examination and it was impossible to determine if the auto-pilot was being used before the accident. Several settings of the navigational equipment were determined but none were significant as factors to the accident. The aircraft logs, found among Mr. Thorne's property at his residence, showed the attitude and directional gyros of the aircraft were vacuum driven. The aircraft had been completely inspected at the time of sale and was considered to be in near perfect condition.

While the purchase was being considered Mr. Thorne was given a demonstration flight and following consummation of the sale the seller suggested he take instruction before operating the aircraft. Pursuant to the suggestion Mr. Thorne flew with an instructor for about two hours. During this time he insisted the instruction be confined to takeoff and landing practice. After the flight the instructor told Mr. Thorne he was not considered checked out; however, Mr. Thorne stated he could fly the aircraft and took no further instruction. The instructor testified during the public hearing that Mr. Thorne's flying was "very rusty" and showed little evidence that he had accumulated 3,000 hours or that 800 hours were instrument.

Several other witnesses who had flown with Mr. Thorne also testified during the public inquiry. Most stated that he was familiar with the aircraft instrumentation and knew how to use it. They stated he seemed careful and conservative while flying. One witness who had flown considerably with him, and who had some piloting experience, stated that she had been with him when he climbed through the overcast on several occasions and he did not use the aircraft's auto-pilot. She stated he was in the habit of climbing and descending while controlling the aircraft manually. She added, however, that he did use the auto-pilot during en route flight and was fully acquainted with its use and operation.

During the investigation it was learned that a 52-gallon nonstandard auxiliary fuel tank was installed in the aircraft baggage compartment. The modification work and necessary weight and balance computation were complete and the data was submitted to the CAA for approval. The ACA-337 (Major Repair and Alteration Report) form accompanying this data was dated October 6, 1955. Final approval for this installation had not been given and the aircraft should not have been operated pending such approval. Mr. Thorne, however, continued to fly it contrary to Civil Air Regulations governing such alteration.

The day of the accident Mr. Thorne arrived at the airport during the early morning hours and at 0444 departed in N 25C intending to fly to Las Vegas. At 0452 he returned to the airport and landed. He called the CAA communicator and canceled his flight plan commenting that he returned because the navigation lights, Grimes lights, and radio had failed in flight. He further stated that the Grimes lights had been installed Saturday (October 15) and he suspected an electrical problem from the installation which incorporated the lights that failed in a common circuit.

During the day Mr. Thorne told Pacific Airmotive Corporation employees that he was dissatisfied with the installation and wanted the Grimes lights repositioned farther forward on his aircraft. He insisted that one be mounted above and just behind the pilot seat on the top of the fuselage. The other was installed on the bottom of the aircraft slightly farther rearward than the top light. With the one on top mounted upward and the other inverted the resultant rotating flashes moved in opposite directions. Both lights were controlled by separate switches and could be turned off or on independent of each other and any other lights on the aircraft. The lights were functionally tested and operated normally. Employees of the repair agency stated that because the aircraft logs were not in the aircraft a new computation of the

aircraft center of gravity was not made nor was a Major Repair and Alteration Report, form 377, completed. Also, no electrical analysis was made following the light installation and no flight test was performed to determine how the lights functioned in flight or if any reflection or glare resulted during their operation. While the relocation work was performed it was determined that the prior failure of the navigation and Grimes lights had occurred because an inadequate circuit breaker was installed during the original installation on that circuit. The radio trouble was repaired by replacing a burned-out tube.

During the accident investigation flight tests were conducted to determine what, if any, effect the Grimes rotating lights had on a pilot while flying in the overcast. These tests were considered especially important because Mr. Thorne apparently lost control of his aircraft while flying in the overcast. Using a Beech Bonanza, with nearly identically mounted lights, the tests were flown by a qualified instrument pilot and observed by a Board investigator. The suspicions of the accident investigators were borne out during these tests and it was learned that an immediate and seriously distracting effect was caused by the lights. It was learned that the opposite rotation and brilliance of the forward mounted lights caused the clouds to appear to move in, out, up, and down when the flashes struck the aircraft wings and propeller, reflecting into and around the cockpit. The pilot was immediately confronted with serious vertigo^{3/} which required the highest degree of skill and concentration to maintain instrument control of the aircraft while being affected by the distracting conditions. From the tests it was concluded that lights installed and operating in this manner could cause distraction and vertigo of a disastrous effect on pilots with limited experience.^{4/}

Through investigation and testimony of witnesses it was learned that Mr. Thorne slept from 2230 on Saturday, October 15, until 1200 the next day. On Sunday he slept from 1800 until 2300, after which he attended a party celebrating his 41st birthday. Following this he was driven to the airport. He

^{3/} Pilot vertigo as appropriately defined in a recent Flight Safety Foundation Bulletin, states, "Webster defines vertigo as 'dizziness or swimming of the head.' In aeronautical circles the word usually means a loss of the sense of the true vertical, as well as a turning sensation. Furthermore, vertigo doesn't mean merely that one does not know which way is up; one feels strongly that some wrong direction is the proper one. The feeling isn't vague. It is almost overpowering. Vertigo is apparently affected by vision as well as the other cues to balance."

^{4/} As a result of the Board's investigation of this accident the Aircraft Owners and Pilots Association and the Beech Aircraft Corporation issued bulletins to pilots describing the effects of flicker vertigo from using these lights in an overcast. Beech advises "turn off your rotary beacons before entering an overcast."

received little sleep on Monday and spent the day overseeing the light relocation. Many persons said Mr. Thorne appeared tired throughout the day and evening before the flight which resulted in the accident.

Officials from the CAA Office in the region where the accident occurred testified during the public hearing and expressed dissatisfaction with the Civil Air Regulations governing flights within a control zone. They pointed out there was no clear delineation in the rules that distinguished IFR and VFR flight conditions. They stated there is misunderstanding regarding the nature of a traffic clearance wherein some pilots believe that a clearance to "take off from" or "enter" a control zone automatically released the pilot from adherence to pertinent regulations relating to pilot qualification or certification. Many pilots further believed such clearance on a VFR flight plan also permitted a climb through an overcast or other flight when control of the aircraft was possible only by reference to flight instruments. The witnesses emphasized that among highly qualified aviation personnel the intent of the existing regulations to prohibit such abuse was understandable; however, for enforcement purposes, a responsibility of the CAA, the rules were ambiguous and lacked sufficient specificity to provide that intent with adequate enforceability.^{5/}

Following the accident, in the interest of corrective action, greater supervision, and safety, CAA operations personnel of the region require a pilot filing a flight plan to indicate whether or not he holds an instrument rating. This information will be furnished the tower controllers interested in the flight and if conditions of weather are less than 1,000 feet ceiling and/or less than one mile visibility the pilot on a VFR clearance will be advised to postpone the flight or file the flight plan according to instrument rules. Further, aircraft arriving in the control zone under a VFR flight plan in the stated conditions will be reported to enforcement officials for investigation.

Analysis

As indicated the Thorne aircraft was observed to take off in a normal manner and to begin a right climbing turn in apparent conformity to the departure clearance. Thereafter it established the climb out heading and disappeared from view in the overcast. Several qualified witnesses stated that during this time the engine seemed to be operating normally and the aircraft was fully lighted, including the rotating beacons. Shortly thereafter, however, the engine and propeller sound increased in a manner which indicated to the

^{5/} As a result of the extent of the misunderstanding that seems to exist among pilots and the position the CAA has taken with respect to the enforceability of the regulations, the Board has initiated action looking toward the amendment of Sections 60.30, 60.31, and 43.65.

Such amendments would be designed to state specifically those minimum weather conditions below which VFR flight could not be conducted within a control zone even though a traffic clearance were obtained.

observer that the Bonanza was turning left and descending rapidly. This was confirmed when N 25C suddenly emerged below the overcast in a tight left spiral. This series of events and the manner in which they occurred strongly indicate that Mr. Thorne lost control of the aircraft and a characteristic descending spiral resulted. It is also believed that the loss of control probably was induced by vertigo and the pilot followed his sensory indications in controlling the aircraft's attitude rather than indications from the appropriate flight instruments. This opinion is supported by the general problems of instrument flight and by other accidents or near accidents which occurred in the same manner for this reason. It is believed that following the initial spiral Mr. Thorne was unable to recover full control of the aircraft and continued to reenter and dive out of the overcast. He was apparently flying alternately under visual conditions, immediately thereafter confronted by instrument conditions, and was never able to regain complete control of the aircraft. During this time he flew several circular patterns, obviously influenced by desperation and panic and possibly attempting to return to the airport or avoid high terrain on all sides except the west. It appears that he then tried to climb through the overcast again but before reaching the clear area above it entered another steep descending spiral. An abrupt turning pull-up from this spiral caused structural failure.

An aircraft, like any other mechanical piece of equipment, can be expected to fail if its design limitations are exceeded. In this case, as indicated previously, the investigation did in fact establish that the design limitations of N 25C had been exceeded in the abrupt pull-up following the final dive, and that no mitigating structural design deficiencies were involved in the failures. While the excessive loads were undoubtedly imposed inadvertently or as a final desperate move to arrest the dive, this fact cannot be considered as a reflection on the aircraft design. While such factors as cleanness of design, comparatively light stick forces, turbulent air, etc., undoubtedly do contribute to the ease with which control is lost there is no substitute for proper instrument training and proficiency for a safe and sound operation of aircraft in overcast weather conditions.

Based on all the known conditions and circumstances the Board is of the opinion that the initial vertigo was the result of several adverse factors personal in nature to Mr. Thorne and circumstantial to the situation.

The first of these factors is believed to have been his general disregard and disrespect for safe instrument flying practices and procedures. It appears that Mr. Thorne was quite willing to climb through the overcast without clearance, proper certification, or regard for other possible traffic. Although violation charges were filed against him and he was recently reprimanded for these practices he again without the required certification knowingly attempted to conduct another flight through the overcast. Although the Board is reluctant to associate the pilot's driving record with his flying habits ample evidence leads to the opinion that they were similar. The fact that Pilot Thorne did not hold an instrument rating does not necessarily mean that he was incapable of instrument flight; however, the Board feels that it may indicate he was unsure of his ability and proficiency to the extent that he was unwilling to attempt to qualify for the rating.

The second factor is considered circumstantial and is believed to have been partially responsible for the apparent vertigo. This factor was the effect produced by the forward-mounted rotating beacons. During flight tests the opposite rotating flashes and the attendant reflection were capable of inducing serious and immediate vertigo on a qualified instrument pilot. The Board is therefore of the opinion that it probably affected Mr. Thorne in a like manner. Considering his fatigued condition it is believed he was even more susceptible to vertigo, and it is believed the fatigue would also delay corrective action during the initial loss of control and thereafter while attempting to regain it.

The Board feels that there was little justification for the repair agency having installed an inadequate circuit breaker in the initial installation or for having undertaken the installation or relocation of the lights without determining that Mr. Thorne had the necessary aircraft records for them to complete the work and properly return the aircraft to service. Although maintenance personnel were reluctant to relocate the lights because of the suspected glare and reflection the work was done despite this concern. Lacking the necessary completion of the ACA-337 form the aircraft was being flown with an unapproved installation. Further, the added electrical load of the rotating beacons and the existing electrical loads of the aircraft equipment, good practice would have necessitated an electrical analysis. Considering all factors, Mr. Thorne was operating the aircraft contrary to Civil Air Regulations pertaining to such installations.

The Board has considered the possible use of the auto-pilot during the departure and the possibility of it failing as a factor in the accident. However, complete destruction of the components necessary to determine this possibility precluded the Board's ability to make such a determination. Considering the testimony as to the habit of Mr. Thorne to control his aircraft manually during climb out there is no reason to believe he did not do it this way on the subject flight. Also considering that the attitude and directional gyros were vacuum driven the aircraft could have been manually operated if the auto-pilot was not working provided there was adequate cockpit lighting to see the instruments. The continued operation of the navigation lights throughout the flight indicates that there was available electrical power for cockpit lighting.

Findings

On the basis of all available evidence the Board finds that:

1. Joel W. Thorne held a valid commercial pilot certificate and medical certificate but did not hold an instrument rating.
2. Violation charges were pending against him for entering the overcast without clearance and without an instrument rating.
3. Mr. Thorne was fully aware of the charges and that his flights were contrary to safe practice and the intent of Civil Air Regulations.
4. Despite this knowledge he knowingly attempted another flight through the overcast October 17.

5. The takeoff and climb out appeared normal until the aircraft entered the overcast.

6. After entering the overcast control was lost and the aircraft began a left descending spiral.

7. Several circular patterns were flown during which the flight climbed into and emerged below the overcast several times in a manner indicating partial control accompanied by panic and desperation on the part of the pilot.

8. Without regaining full control the pilot reentered the overcast at a steep angle but failed to reach the clear area on top before entering another descending spiral.

9. During the attempted recovery the aircraft was subjected to forces beyond its design structural strength.

10. The installation and relocation of the rotating beacons were not in accordance with required procedures.

11. Flight tests with similarly located lights induced immediate and serious pilot vertigo, which was an element contributing to the initial loss of control in the subject accident.

12. There was no evidence found to indicate malfunction or failure of the aircraft structure or controls prior to the load-induced failure.

13. Ascertainment of the possibility of electrical failure or determination of electrical equipment being used through physical evidence was precluded by a complete destruction of that equipment.

Probable Cause

The Board determines that the probable cause of this accident was the pilot's loss of control during which the design strength of the aircraft was exceeded causing structural failure. Vertigo, and the pilot's inability to take corrective action, were contributing factors.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ROSS RIZLEY

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

S U P P L E M E N T A L D A T A

Investigation and Hearing

The Civil Aeronautics Administration was notified of this accident and an investigation was conducted in accordance with Public Notice 7, effective January 1, 1954, as amended April 1, 1954, which delegated the Board responsibility to investigate aircraft accidents involving aircraft weighing 12,500 pounds or less.

On November 10, 1955, the Board terminated the delegation of responsibility for the investigation of this accident by the CAA and directed that an investigation be made by the Board in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. An investigation was immediately initiated and a public hearing was held by the Board in Hollywood, California, on December 19-20, 1955.

The Aircraft

N 5825C, Beech model C-35, was manufactured in 1951 with serial number D-2777. It was resold several times before being purchased by Mr. Thorne, June 10, 1955. An annual inspection was completed before this date at which time the total aircraft time was 1,106 hours. There were no log book entries after the inspection and the accumulated aircraft time since then is unknown.

The powerplant, Continental model E-225-8, was installed July 10, 1953, with zero hours and had accumulated 304 hours on June 10, 1955. The propeller, Beech model 215-109, was original installation and had accumulated 800 hours on July 10, 1953. It was overhauled before being installed on the new engine July 10, 1953.

PROBABLE FLIGHT PATH OF BEECH BONANZA N-5825C NORTH HOLLYWOOD, CALIFORNIA

OCTOBER 17, 1955

