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CIVIL AERONAUTICS BOARD

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SAFETY DIVISION

ACCIDENT INVESTIGATION REPORT

Adopted: October 2, 1956

Released: October 8, 1956

CAPITAL AIRLINES, INC., VICKERS VISCOUNT, N 7404, MIDWAY AIRPORT,
CHICAGO, ILLINOIS, FEBRUARY 20, 1956

The Accident

At approximately 0811, ^{1/} February 20, 1956, a Capital Airlines Vickers Viscount, model 744, N 7404, crashed during the final portion of a landing approach at Midway Airport, Chicago, Illinois. Minor injuries were suffered by only a few of the 37 passengers and the crew of five. The aircraft was substantially damaged.

History of the Flight

Capital Airlines Flight 141 of February 20, 1956, originated at Willow Run Airport, Detroit, Michigan, and was a regularly scheduled flight to Chicago. The crew consisted of Captain Roger Harrison Taylor, First Officer George Richard Hanst, and Stewardesses Jacqueline V. Sadowski and Gloria Galloway. Captain R. E. Gilliland, the fifth assigned crew member, was deadheading to Chicago and rode in the passenger cabin.

Following a weather briefing, which included a review of en route and terminal weather forecasts, a VFR flight plan was filed.

Departure from Detroit was at 0700. The gross takeoff weight of the aircraft was 54,701 pounds, which was below the specified limit; the load was distributed properly with respect to the center of gravity of the aircraft.

The flight to the vicinity of Chicago was routine. Near Chicago Flight 141 reported to the Chicago tower that it was over the shoreline. The flight later reported passing Kedzie and was cleared to land on runway 31R.

The flight was observed to make a right turn to final approach and appeared to descend in a normal manner until over the west side of Cicero Avenue (the eastern boundary of the airport) at an altitude of 25 to 50 feet above the ground. At this point the airplane appeared to decelerate and descend rapidly. The aircraft was further observed to strike the ground in a slightly nose-up attitude several hundred feet short of the threshold of the runway, and the top of the fuselage was seen to break open adjacent to the wing spar to fuselage attachment. As the aircraft proceeded down the runway the landing gear retracted and the aircraft then slid on its belly until it came to rest to the left of the runway, 1,626 feet beyond the point of initial impact.

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

All occupants left the aircraft through emergency exits or the main cabin door. The fire department, having been called by tower personnel, arrived at the scene before all persons had evacuated the aircraft. However, there was no fire.

The Chicago weather at 0720 was reported as: Sky clear, visibility 6 miles; smoke; wind north-northwest 7.

Investigation

At the time of the accident runway 31R of Midway Airport was clear except for approximately two inches of ice and snow along the edges. The aircraft touched down on its main landing gear on the east taxiway 414 feet short of the threshold of the runway, and tire marks were visible throughout the distance to the runway. No nose gear marks were found. The next discernible marks were slashes made by the Nos. 1 and 2 propellers, as the blades of these propellers struck the ground. These marks started 343 feet from the runway threshold, and were regularly spaced a distance of 30 and 50 feet, respectively. Additional marks indicated that the fuselage had contacted the ground 258 feet in front of the threshold. First slash marks made by the Nos. 3 and 4 propellers were found at a point 113 feet before the threshold. It was determined from the pattern of marks that in proceeding down the runway the aircraft gradually swerved and crossed the left boundary of the runway approximately 1,200 feet beyond the initial contact point. The aircraft came to rest on a heading of 355 degrees, 1,626 feet from the point of initial contact and just to the left of runway 31R. The main landing gear and the nose gear were found retracted. Captain Taylor said that to the best of his knowledge neither he nor the first officer touched the landing gear selector lever after it had originally been put in the down and locked position.

During the slide down the runway the No. 1 propeller, the No. 4 left exit window, and the left landing gear door separated from the aircraft and were found to the left of the runway 770 feet beyond its threshold. Small aircraft fragments such as sheared rivet heads and pieces of skin were found along the ground path.

The aircraft sustained major structural damage at the time of landing and during the subsequent slide. The main landing gear oleo struts were completely bottomed on impact. The left wing lower spar cap failed in the area rearward of the No. 2 nacelle and the upper spar cap failed adjacent to the fuselage attachment. Considerable buckling and tearing of the upper left wing skin and main spar web were found in the general area of the fuselage and the No. 2 nacelle.

The fuselage broke open in the vicinity of the main spar attach frame. This rupture started at the upper fuselage centerline just to the rear of the ADF (Automatic Direction Finder) antenna cutout and extended downward and rearward on both sides to the wing fillet. Visual examination of the wing and fuselage and subsequent laboratory examination of specimens of the fuselage structure disclosed no evidence of metal fatigue.

The landing gear selector switch, located in the cockpit, was found in the "gear-up" position. The landing gear selector valve and its associated

actuator were also found in the "gear-up" position. The gear-down lock pins were not sheared and the housing into which these lock pins extend was not damaged. A continuity check of the electrical circuit between the cockpit gear selector switch and the selector valve actuator was made and this circuit was found to function in a normal manner. A shallow detent holds the landing gear selector lever in either the up or down position and only a slight force is necessary to move the lever when the weight of the aircraft is off the landing gear and the airspeed is above 85 knots.

The wing flap gearbox mechanical indicator reading and the gearbox limit switch positions indicated that the wing flaps were in the 40-degree down position at the time of impact. The torque tube, which extends outboard from the gearbox on either side, was damaged and failed during the ground slide. Failure of the torque tubes permitted the flaps to pivot freely. No evidence was found to indicate that the wing flaps and their associated systems had not functioned properly prior to ground impact. Flaps may be positioned either 0, 20, 32, 40, or 47 degrees. Owing to an interconnection between the throttles and the flap lever, the flaps will return automatically from the 47-degree to the 40-degree position if one or more of the throttles are advanced more than one-third.

In the interior of the fuselage all passenger and crew seats were undamaged and seat-to-floor attachments were intact. All seat belts were in good condition and fastened to their respective seats. When the main fuselage fracture occurred, both left and right hatracks pulled free from the forward cabin partition and intermediate fuselage frame attachments, and dropped down to near the tops of the seat backs.

Two of the six frangible crash switches and one of the two inertia crash switches actuated on impact. This permitted the crash circuit to release CO₂ into the cargo compartments and methyl bromide to be discharged into all engine nacelles.

There was no evidence to indicate any inflight failure or malfunctioning of the airframe or flight controls.

Viscount aircraft are powered with four turbine-propeller engines. The propellers are of the full-feathering, nonreversing, constant-speed type, each with four blades made of duralumin. The ratio of the rotating speed of the turbine to that of the propeller is 9.43:1. The normal turbine operating range is from 4,750 r. p. m. minimum ground idling to 14,500 r. p. m. at takeoff.

Blades of all propellers were damaged in the same general pattern, bent rearward with some curl. Examination of the propellers showed them to be in normal condition other than the damage done at impact. No operating failure of detailed parts, abnormal wear, or deterioration of seals was evident. The pistons of all propellers, when examined, were fully forward, which represented a blade angle of four degrees.

Investigation revealed that all engines had suffered substantial damage. This damage consisted primarily of the breaking of all nose cases, except that of No. 2 engine. The propellers and reduction gears of Nos. 1 and 3 engines

were totally separated from their respective engines. The first stage compressor outer casing of No. 1 engine was fractured at the bottom extending along the inboard side. All blades of the high pressure turbine, portions of the intermediate nozzle guide vanes, and the low pressure turbine wheel buckets of this engine were burned in varying amounts. No indication of overheating was evident in any of the other engines.

First Officer Hanst testified that everything in connection with the flight was routine until the final portion of the approach to Chicago. He said that the captain flew the aircraft from the left pilot's seat and that during the approach he followed the captain's instructions with regard to lowering the landing gear and flaps, etc., and still had his left hand on the flap lever when over the east boundary of the airport. At this point the captain reduced all power and simultaneously called for 47 degrees of flaps. As Hanst moved the flap control to 47 degrees he felt the aircraft decelerate and settle. Glancing at the instrument panel he saw that three of the four 17-degree pitch lights were lighted. The 17-degree pitch lights are actuated by a blade switch on each of the four propellers when the blades are at 17 degrees or below and warns the pilots that the blades are below the 21-degree pitch position which is normally the minimum in-flight blade angle. The filament of one of the light bulbs was found to be broken when tested during the investigation. First Officer Hanst said: "I knew that that was an abnormal situation, and the only way I could think to get out of it was to apply power ..." Consequently, he pushed the throttles forward quickly and when they were three-quarters fully forward the aircraft struck the ground; he immediately closed all throttles. Captain Taylor said that during the flight he did not see any of the propeller warning lights come on, and that he did not know that the first officer advanced the throttles during the latter part of the approach.

In addition to the four 17-degree pitch warning lights, a warning light is provided in the cockpit that is illuminated when the four 21-degree pitch lock solenoids are energized. The 21-degree pitch lock functions as an inflight low pitch stop. The design of the propeller provides that this stop be withdrawn when the pitch lock solenoid, which is incorporated in the propeller control unit, is energized and the blade angle required to maintain the selected r. p. m. is less than 21 degrees. Three factors which determine the blade angle are selected r. p. m., power output of the engine, and airspeed. Energization of the pitch lock solenoids normally is accomplished by switches which are closed by the telescoping action of the landing gear upon landing and when the throttle-actuated switches are closed by retarding the throttles below the takeoff position. An emergency switch is provided in the cockpit to deactivate the pitch lock solenoid circuit should it be energized in flight for any reason, as would be indicated by the pitch lock solenoid warning light. Subsequent to the accident, the wiring of this circuit and the warning light were checked and found to be capable of normal operation.

Hanst said that prior to taking off at Detroit all propeller-lock warning lights were set to daylight brightness by rotating the light covers to their widest aperture. He also testified that because of the location of the propeller system lights on the left side of the cockpit some difficulty is experienced during daylight hours in readily determining if the 21-degree pitch lock solenoid light is on, and especially so under certain cockpit lighting conditions.

Captain Taylor testified that during the "Before Takeoff Check" at Detroit all propeller warning lights functioned in a normal manner. He described the flight from Detroit to Chicago as one which was routine and said that no difficulty was experienced until on final approach. He also said that when over the Kedzie marker at an airspeed of approximately 150 knots the landing gear was lowered, the three green landing gear indicating lights which illuminate when the gear is down and locked were seen lighted, and the hydraulic pressure was within prescribed limits. He further testified that he observed the 21-degree pitch lock solenoid light to be out. Shortly thereafter the flaps were lowered to the 30-degree position and later to 40 degrees when the aircraft was approaching Cicero Avenue. He said that he estimated the height of the aircraft, when over Cicero Avenue, to be 50 to 60 feet above the ground and that the airspeed was approximately 120 knots. After passing this point, power was rapidly reduced and he called for 47 degrees of flaps. When power was reduced, the aircraft decelerated and descended rapidly. There was no apparent yaw and no turbulence was noticed. Over the east edge of the airport ramp, and at an altitude of about 25 feet, he checked the airspeed again and it was then 105 knots. Immediately following, when the flareout was started, the airplane did not respond as expected, but continued to sink rapidly and struck the ground. The attitude of the aircraft at impact was approximately five degrees, nose up. The captain said that during the attempted flareout the aircraft responded to the controls; however, the descent was so rapid that the touchdown occurred almost where the attempted flareout began. He said that there was no evidence of a stall and the stick shaker^{2/} did not operate.

All witnesses to the approach of the aircraft, including some with Viscount piloting experience, said that the approach appeared to be normal. They expected the aircraft, because of the glide angle and speed, etc., to land farther down the runway, and were surprised when it settled so rapidly. None of the witnesses could reconcile the rapid deceleration and drop of the aircraft with its normal attitude and apparent speed at the time.

Several persons who were located near the accident scene said that prior to touchdown they saw a break in the top of the fuselage of the aircraft. These people were questioned and their exact positions at the time their observations were made were plotted on a chart.

After the airplane came to rest, Captain Gilliland, who had been riding in the passenger cabin, advised the captain, who was still in the cockpit, that the passengers were getting out in an orderly manner. The stewardesses testified that after the airplane came to rest they directed their attention to different sections of the cabin, front and rear, according to their training. The stewardess in the rear part attempted to open the main cabin door but was unable to do so. She then proceeded forward and observed passengers opening the window emergency exits. A plastic handle of one of these broke and this exit was not opened. In all, three or four of these exits were opened and some passengers left the airplane in this manner. After only a few persons had used the emergency exits, the main cabin door was opened and the remainder departed through this door in an orderly manner. The other stewardess said that she was unable to go all the way forward

^{2/} A stall warning device.

because of passengers in the aisle, and had helped the other stewardess with the evacuation from the rear of the cabin. In the meantime, Captain Gilliland, who was seated forward, made several unsuccessful attempts to open the front cabin door. This door was later opened from the outside. It was estimated that all passengers were deplaned in approximately three minutes. After leaving the aircraft, passengers were taken by automobile and bus to Capital's passenger terminal.

The intercommunication system between the cockpit and the main cabin was disconnected at impact by the operation of the inertia switches. The captain testified that no instructions were given the stewardesses throughout the evacuation because Captain Gilliland had reported that the evacuation of passengers was proceeding in a normal manner and that he considered no fire hazard to be involved.

Investigation disclosed that the attempted landing on runway 31R was being made contrary to the company's Runway Restriction Data book for Viscount aircraft. This book lists the allowable aircraft takeoff and landing weights under varying conditions of wind and temperature for runways of airports used by the company. Captain Taylor failed to note a revision to the Data book, issued January 23, 1956, which indicated the landing weight of the aircraft was approximately 3,856 pounds in excess of that allowed under existing conditions. The data on this runway was intended to prevent an overrun, because of the runway's effective length, and has no bearing on this accident.

Four landing gear actuated switches constitute a portion of the 21-degree pitch lock solenoid circuit. One, each, on the right and left main landing gears are in the positive and negative legs of the circuit, respectively. There are two like switches mounted fore and aft on the nose gear. The forward switch is in parallel with the right main gear switch and the aft switch is in parallel with the left main gear switch. Conductivity of one of the two switches in the positive leg and one of the two switches in the negative leg will permit the propeller to attain blade angles below 21 degrees under certain flight conditions. Blade angles below 21 degrees are intended only when the aircraft is on the ground.

Three of the landing gear switches were found in an unsatisfactory condition; no other irregularities were noted in the entire propeller and propeller control system.

The switch mounted on the right main landing gear was found to contain water in the switch housing, including the contact cavity, and showed evidence of corrosion. The switch operated freely; however, a considerable amount of corrosion products in granular form were loose inside the switch housing. Significant with respect to the water found in this switch housing is that the aircraft was exposed to a 19-degree F. temperature for approximately one and one-half hours at Detroit, Michigan, prior to takeoff for Chicago, Illinois. This condition was simulated in laboratory tests and in about 45 minutes the moisture in the switch was frozen so that the contacts would not open.

Initial checks of the landing gear mounted switches revealed the contacts of all to be open, except the switch on the left main gear. This switch was found to be stuck in the closed position. This sticking of the contacts could be

duplicated readily. Laboratory examination revealed a deposit of silver oxide on the contact surfaces. After this deposit was removed, sticking no longer occurred. It was found during laboratory tests that silver oxide deposits could be formed on the contact surfaces when the contacts were bridged by water while an electrical potential existed across the contacts.

The third switch found to be unsatisfactory was the one mounted on the aft side of the nose gear. When initially checked at the scene, this switch was found to operate in a normal manner. Subsequent laboratory examination revealed it to be badly damaged as though subjected to fire within the unit and electrical contact could not be obtained between any pair of the contacts. The condition of this switch, though unsatisfactory, is not believed to be pertinent to this accident.

At the time of the accident, Capital Airlines had not established a system of periodic internal examination of these switches in that examination would be conducted only in the event a malfunctioning was reported. The night before the accident the same crew flew the aircraft from Chicago to Detroit and reported that the aircraft operated in a normal manner.

During the investigation, it was determined that a Boeing 377 aircraft was preparing for takeoff on runway 31L when the Viscount was approaching runway 31R. Witnesses reported that the aircraft was parked between the two runways in a position such that the slipstream from its propellers during rump would have a detrimental effect on an aircraft in the approach zone. None of the witnesses could definitely place the location and heading of the Boeing aircraft when its engines were actually run up. The crew of the Boeing testified that when the engine rump was made, the aircraft was parked in the designated rump area between runways 31L and 31R headed southeast, parallel to the runways. Tests were conducted by the National Advisory Committee for Aeronautics at Langley Field, Virginia, using a USAF Boeing KC97F, the military counterpart of the B-377. These tests showed that the slipstream produced by the propellers of the aircraft, when it was parked in an area comparable to that between runways 31L and 31R of Midway Airport, could have had no detrimental effect on an aircraft in the approach zone.

At the request of the Board, the manufacturer conducted flight tests to determine Viscount flight characteristics in the event power was suddenly applied during an approach when the propellers were being governed below the 21-degree pitch stop. As a part of the tests, a landing was made with all propeller stops withdrawn. Throttles were closed during the approach, the aircraft was held off the runway to the lowest speed possible, and touchdown was made at approximately 90 knots. The elevator control force was considered to be high, but not abnormal, for this type of landing. The propellers were observed to reach the ground fine pitch stop just before the aircraft touched down. It was obvious to ground observers, because of the increasing nose-up attitude, that the aircraft was held off the ground as long as possible; otherwise, the landing appeared normal.

Another test was made under similar conditions. At an airspeed of 100 knots, and about 8 feet above the ground, all throttles were quickly opened about half-throttle distance. When this was done, there appeared to be a complete loss of lift and the aircraft sank rapidly to the runway. The aircraft's attitude did not change, and no changes were noticed in elevator forces. Ground observers said the airplane dropped about 8 feet onto the runway.

As a result of the investigation of this accident, immediate corrective action was taken:

1. A dual, 21-degree pitch lock solenoid warning light was installed on all company Viscount aircraft. This second light is a safety factor in the event of a broken or burned-out bulb.
2. A 300-hour periodic check of all microswitches was implemented. This requires their removal and installation of newly overhauled microswitches.
3. A hole was drilled in each microswitch case to allow excess moisture to drain from the switch.
4. Prior to installing any new switch received from the manufacturer, an inspection of the switch will be made.

Following the public hearing of this accident, the company decided to take this additional immediate corrective action:

1. A test circuit was installed in all Capital Airlines Viscount aircraft consisting of a dual light and single pole double throw switch which provides a means to check, while in flight, the positive and negative sides of the 21-degree pitch solenoid circuits to determine if the microswitches are malfunctioning. This test circuit will also indicate an inadvertent positive or negative feed which might have been introduced directly to the wiring of the circuit.
2. The 21-degree pitch lock warning lights were duplicated on the fire control panel in front of the copilot.
3. Hermetically sealed landing gear actuated microswitches were ordered and are to be installed upon delivery.

Analysis

Capital Airlines placed the Viscount aircraft in passenger service in July 1955, and Captain Taylor was qualified as captain on this type aircraft July 4, 1955.

The captain stated that early in the landing approach the landing gear selector lever was placed in the down position, and the three green lights, indicating the gear was down and locked, were observed. He further said that to his knowledge this lever was not touched again; the first officer agreed with this statement. Shortly after initial ground contact, the nose gear and the two main gears retracted. Examination of the landing gear components disclosed that the down lock pins were not sheared, the hydraulic selector valve and its electrical actuator were found in the gear-retracted position, and the cockpit selector lever was found in the gear-up position. These facts, and other evidence definitely indicate that the system was actuated hydraulically by movement of the cockpit selector lever. It is considered likely that the landing gear selector lever was moved unknowingly by a crew member following impact. It is also believed that the gear retraction minimized the possible serious consequences of the fuselage break.

Considerable thought was given to the possibility that the aircraft stalled. Captain Taylor testified the speed of the aircraft was approximately 105 knots at the time of the drop. This is well above the stalling speed of the aircraft which, under existing conditions, would have been approximately 81 knots. The captain also said that the stall warning device (stick shaker) did not operate. This device is designed to warn the pilot when the speed of the aircraft is 5 to 15 knots above stalling speed. It is thought that the slight nose-up attitude at the time of touchdown was not of sufficient magnitude to have caused the aircraft to stall. It is concluded, therefore, that the aircraft did not stall.

Several of the witnesses at the public hearing testified that this fuselage failure occurred in flight, just before the ground impact. Accordingly, this possibility was thoroughly explored. Sections of the fuselage skin and stringer material from one side of the fracture were removed and sent to the Bureau of Standards for testing and evaluation. The Bureau's report clearly shows no evidence of fatigue or defective material. The fractures were all of the ductile, overload type; therefore, it is virtually impossible that these failures occurred in flight. This is also true because, in the absence of a fatigue failure, excessive loads would have to have been applied to produce the failure. An evaluation of the fuselage loading for the time involved indicates that the aft fuselage would be very lightly loaded during the approach condition. Since no violent maneuvering was involved, it is inconceivable that excessive loads, sufficiently high enough to fracture the fuselage, could have been imposed in flight. Further, the reported and observed flight path is not consistent with an inflight fuselage failure. Had the fuselage failed in flight, the down-balancing tail load would have been relieved and the aircraft would have violently pitched nose downward. The developed facts indicate that this did not happen. In summary, the fuselage failure did not occur while the aircraft was airborne; the failure undoubtedly occurred as a result of the hard landing. The wing spar failures and the condition of the main landing gear are further evidence of the severity of the landing.

The circuit of the 21-degree pitch lock solenoid contains four microswitches, two connected in parallel on the positive side and two connected in parallel on the negative side. This necessitates that one switch on each side of the circuit be electrically conductive before the solenoid is energized, thus completing one of the steps toward withdrawal of the 21-degree pitch stops. This circuit is designed expressly as a safety measure in that malfunctioning of two switches is required to establish an unwanted circuit. However, this double failure feature of the circuit was compromised in that a failure of one switch could go undetected for an indeterminable period of time. No specific inspection period had been established for these switches.

Examination of these microswitches showed three were capable of having malfunctioned by either freezing or sticking. In the light of the first officer's statement that he saw the 17-degree pitch warning lights on before touchdown, it is concluded that at least two of these switches malfunctioned in flight.

The first officer stated that simultaneously with the execution of the captain's command for full flaps he saw three of the 17-degree pitch warning lights come on. The airspeed at that time was approximately 105 knots. Seeing these lights, he rapidly advanced all four throttles approximately two-thirds of their travel.

Power control of the Viscount aircraft consists of four throttles which simultaneously schedule r. p. m. and fuel flow for each of the four engines. The propeller response to the signal for higher r. p. m. is more rapid than the engine response to increase power to maintain this r. p. m. This is a normal turbine propeller characteristic and the lag of the Rolls Royce Dart engine is considered to be acceptable. A number of variables, such as airspeed and rate and extent of throttle movement would affect the duration of this lag. In this instance, it is believed the lag was approximately 2.5 seconds. During a major portion of this period, the propeller blades would be at four degrees attempting to maintain the higher called for r. p. m. through windmilling action with resultant greatly increased drag.

Under the above circumstances, two deleterious effects on aircraft performance are produced. These two effects are the increased propeller drag and the loss of wing lift due to the reduced local air velocity over the wing in the area aft of the propellers. In this instance, the loss of lift effect was more significant since the effect was immediate, whereas the drag effect requires a longer time interval to be fully effective. Since the subject aircraft was only 25 to 50 feet above the ground when the drop occurred, and the time interval from the beginning of the difficulty to ground impact was so short, it is thought that loss of lift was mainly responsible. Subsequent flight tests, conducted by the manufacturer, confirmed this belief. These tests also showed that under similar conditions, if the throttles were advanced slowly, drag detrimental to flight and deterioration of lift does not develop.

In conclusion, it is apparent that at least two of the microswitches malfunctioned when the aircraft became airborne at Detroit and continued to do so throughout the flight. The failure of these switches permitted the energizing of the 21-degree pitch lock solenoid, making it possible for the stops to be withdrawn during the approach. The crew did not observe the 21-degree pitch lock solenoid warning light and consequently the emergency switch which was provided to prevent the propellers going into the ground fine pitch range while in flight was not actuated. As the aircraft neared the ground at Chicago, the first officer did see the 17-degree pitch lights come on. No instructions having been provided the crew of the consequence, he quickly advanced the throttles, causing the propellers to immediately seek the lowest possible blade angle. The ensuing loss of lift dropped the aircraft to the ground.

Findings

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

1. The aircraft, the carrier, and the crew were currently certificated.
2. The weight of the aircraft at takeoff was under the maximum allowable gross takeoff weight and the load was properly distributed.
3. The maximum allowable Viscount landing weight for a landing on runway 31R was exceeded.
4. Three of the four landing gear actuated switches, which are located on the landing gear oleo struts and which effect operation of the propeller, were found to have been capable of malfunctioning by jamming, sticking, or freezing.

5. No periodic inspection for internal examination of these switches had been established by the company prior to the accident.

6. At least two of the landing gear actuated switches malfunctioned, making it possible for the 21-degree pitch stops to be withdrawn, and consequently ineffective.

7. The crew failed to see the 21-degree pitch warning light on, and, therefore, they did not actuate the emergency switch.

8. During the final stage of the approach at Chicago, the propellers moved to the ground fine pitch range.

9. When the first officer saw three of the 17-degree pitch warning lights come on, he advanced all four throttles quickly.

10. The rapid advance of the throttles caused the propeller governor control to move the propeller blades to the four-degree pitch position, thereby creating both propeller drag and loss of wing lift.

Probable Cause

The Board determines that the probable cause of this accident was a malfunctioning of the propeller control switches which culminated in an abrupt loss of lift.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE

/s/ JOSEPH P. ADAMS

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

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

Investigation and Hearing

The Civil Aeronautics Board was notified of the accident at approximately 0830, February 20, 1956. An investigation was immediately started in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was ordered by the Board and was held in Chicago, Illinois, March 29, 30, and 31, 1956.

Air Carrier

Capital Airlines, Inc., is a Delaware corporation and maintains its principal offices in Washington, D. C. The corporation holds a current certificate of public convenience and necessity issued by the Civil Aeronautics Board to engage in the transportation of persons, property, and mail. It also possesses a valid air carrier operating certificate issued by the Civil Aeronautics Administration.

Flight Personnel

Captain Roger Harrison Taylor, age 55, was employed by Capital Airlines on December 22, 1934. He held a currently effective airman certificate with an airline transport rating and other appropriate category, class, and type ratings. He had a total of 17,752 flying hours, of which 610 were in the Viscount. He satisfactorily passed his last CAA physical examination on September 28, 1955, with the following waiver: "Holder shall possess adequate protecting lenses for near vision while exercising the privileges of his Airman Certificate." His last route check was on December 21, 1955, and his last instrument check was on January 23, 1956.

First Officer George Richard Hanst, age 38, was employed by the company on February 26, 1951. He held a valid airman certificate with commercial pilot, single- and multi-engine land and sea, and instrument ratings. He had a total of 5,539 flying hours, of which 53 were on Viscount aircraft. His last CAA physical examination was taken on January 13, 1956. His last route and instrument checks were taken on January 5, 1956.

Hostess Gloria Galloway was employed by the company on October 27, 1955. Hostess Jacqueline V. Sadowski was employed by the company on December 8, 1955.

The Aircraft

Viscount aircraft N 7404, model 744, serial number 90, was manufactured by Vickers-Armstrong, Ltd. Date of manufacture was July 23, 1955. Total flying hours were 1,541.

Engines installed in this aircraft were manufactured by Rolls Royce, Ltd., and designated Mark 506. The engines were equipped with propellers manufactured by Rotol, Ltd. Nos. 1 and 3 were type 147/4-20-4/20E, and Nos. 2 and 4 were type 147/4-20-4/18E.