File No. 1-0016

CIVIL AERONAUTICS BOARD

AIRCRAFT ACCIDENT REPORT

ADOPTED. April 9, 1965 **RELEASED:** April 14, 1965

WESTERN AIR LINES, INC., N93131
DC-6B, LOS ANGELES INTERNATIONAL AIRPORT
LOS ANGELES, CALIFORNIA
DECEMBER 17, 1963

SYNOPSIS

Western Air Lines, Inc., Flight 221, a Douglas DC-6B, N93131, struck the runway with the Nos. 1 and 2 propellers while executing a go-around following an instrument approach to runway 25L at Los Angeles International Airport, Los Angeles, California, at 2341 P.s.t., on December 17, 1963. There were no injuries to any of the 46 occupants.

Flight 221, a regularly scheduled passenger flight from San Francisco, California, nonstop to Los Angeles International Airport, entered a fog condition immediately after touchdown on runway 25L, and a go-around was initiated. Shortly after becoming airborne the aircraft settled back onto the runway with its landing gear in transit to the up position. The impact with the runway caused separation of the No. 2 propeller and minor damage to the No. 1 propeller. The go-around was continued on three engines and the flight diverted to Burbank, California, where a successful landing was accomplished.

The Board determines the probable cause of this accident was the failure of the pilot to maintain a positive rate of climb and the premature retraction of the landing gear during a go-around in fog conditions.

Accident

Western Air Lines, Inc., (WAL) Flight 221, a Douglas DC-6B, N93131, operating as a regularly scheduled passenger flight from San Francisco, California, nonstop to Los Angeles, California, struck runway 25L with the Nos. 1 and 2 propellers while executing a go-around under instrument flight conditions at Los Angeles International Airport on December 17, 1963, at 2341 P.s.t.[1/] After striking the runway, the No. 2 propeller separated from the aircraft, and a three-engine climbout was effected. The flight diverted to the Lockheed Air Terminal, Burbank, California. There were no injuries to any of the 46 occupants.

Investigation

The flight had been dispatched from Los Angeles under a single release [2/] as

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1/ All times herein are Pacific standard based on the 24-hour clock

2/ In accordance with company procedures the single release was valid for both flights.

combination Flights 200/221. The Los Angeles to San Francisco segment was designated as Flight 200 and was scheduled to depart Los Angeles at 2000. The return segment to Los Angeles was designated as Flight 221 and was scheduled to depart San Francisco at 2200.

The crew consisted of the captain, first officer, second officer, and two stewardesses. Another WAL captain was occupying the cockpit jump seat in the capacity of company check pilot. 3/

A weather briefing and dispatch release were furnished to the crew by a company dispatcher at 1915, prior to the flight's departure from Los Angeles. Attached to the dispatch release were the 1900 U. S. Weather Bureau (USWB) sequence reports for the Los Angeles terminal, as well as for intermediate and alternate airports. The reported weather for Los Angeles International Airport at this time was in part: Clear, visibility 3 miles, smoke and haze, temperature 56°F., dewpoint 52°F., wind west-southwest 5 knots.

The latest available USWB terminal forecast for Los Angeles International Airport issued at 1445 and covering the period from 1500 December 17, 1963, to 0300 December 18, 1963 was 15,000 feet scattered, 7 miles visibility and at 1900 was to become clear with 7 miles visibility.

However, the WAL dispatcher, responsible for Flight 200/221 stated that he discussed the weather forecast for Los Angeles with the captain during the briefing. Based on existing fog conditions in nearby areas, he advised the captain to expect fog conditions with low visibility on his return to Los Angeles rather than the clear skies called for in the USWB forecast.

Flight 200 departed Los Angeles at 2005 and arrived in San Francisco at 2134. The captain and check pilot proceeded to the WAL Operations office where they checked the latest existing and forecast weather for Los Angeles and points en route in preparation for Flight 221. The flight was scheduled to arrive in Los Angeles at 2336. The latest weather reported for the Los Angeles International Airport at this time was the 2100 USWB sequence report. It was Partial obscuration, 16,000 feet scattered, visibility 2 miles, haze, smoke, temperature 55°F., dewpoint 52°F., wind east-northeast 3 knots, altimeter setting 30.11 inches, runway 07 runway visibility 4/ 1/2 mile, runway 24 runway visibility 1/4 mile, runway 06 runway visibility less than 3/16 mile, haze obscuring 1/10 of the sky, visibility west one mile.

3/ This was the captain's first trip as pilot-in-command since June 1960. In accordance with company policy, a check captain was assigned to the flight to requalify the assigned captain for the route involved.

4/ Runway visibility is the meteorological visibility along an identified runway. Where a transmissometer is used for measurement, as it is at the Los Angeles International Airport, the instrument is calibrated in terms of a human observer, i.e., the sighting of dark objects against the horizon sky during daylight and the sighting of moderately intense unfocused lights in the order of 25 candlepower at night.

The Los Angeles terminal forecast issued by the USWB at 2045, valid for a 12-hour period beginning at 2100 was in part as follows. 2100-2200, partial obscuration, visibility 1-1/2 miles, ground fog and haze, dense ground fog in vicinity, 2200-2300, partial obscuration, visibility 1/2 mile, ground fog, 2300-0800, ceiling zero, sky obscured, visibility zero, fog.

No maintenance was required or performed at San Francisco. The aircraft's weight and center of gravity (c.g.) were within the prescribed limitations.

Flight 221 departed San Francisco at 2206 on an Instrument Flight Rules (IFR) clearance to Los Angeles International Airport.

The Flight proceeded normally in accordance with its clearance and at 2315, when in the vicinity of Bakersfield, California, the crew received the regularly scheduled weather broadcast on the Bakersfield low frequency radio range. This broadcast included the Los Angeles surface weather observation. At 2300 this observation was Partial obscuration, visibility 1/2 mile, ground fog, smoke, temperature 51°F., dewpoint 49°F., wind southwest 3 knots, altimeter 30.10 inches, runway visual range (25L) 6,000 feet plus, runway 07 runway visibility 3/4 mile, runway 24 runway visibility 1/2 mile, runway 06 runway visibility less than 3/16 mile, fog obscuring 3/10 of the sky, surface visibility 7/8 mile.

After the flight's arrival in the Los Angeles terminal area the following weather observation for Los Angeles International Airport was transmitted by approach control, "... sky partially obscured; visibility one-half (mile) ground fog and smoke." Normal vectoring services were provided by approach control and subsequently the flight was cleared for an Instrument Landing System (ILS) approach to runway 25L.

At 2337 Western 221 reported over the outer marker inbound. After intercepting the ILS glide slope the flight was instructed to contact Local Control and monitor the localizer frequency for Precision Approach Radar (PAR) advisories. At this time the PAR controller advised Western 221 that it was four miles from touchdown, on course and on glide slope.

At 2339, the flight was cleared to continue the approach and advised that, "the approach and strobe lights 5/ will be cut down at your request." Western 221 was informed by the PAR controller that it was on course and glide slope at 2-1/2 miles from touchdown and requested to, "... advise runway in sight."

At 1-1/2 miles from touchdown the flight was advised by PAR that it was 100 feet left of course on glide slope and at one mile from touchdown it was reported 100 feet left of course still on glide slope. The local controller then cleared the flight to land. At 3/4 mile from touchdown the flight was advised that it was 200 feet left of course and if they did not have the runway in sight to execute a missed approach. Western 221 advised the tower that they had visual contact with the runway at that time The aircraft's radar target was then observed by the PAR controller to correct back to the course centerline prior to reaching the touchdown zone.

5/ Flashing sequence condenser discharge lights.

The captain stated that at a point between the outer and middle marker, the copilot informed him that the approach lights and runway lights were in sight. He then made visual contact with the runway, turned the landing lights on and called for full flaps. At this point, the aircraft was slightly to the left of centerline but a correction was made and the approach was continued on course. The captain further stated that there was, "... at least a half mile visibility on the approach end with approximately 6 to 10 runway lights visible." The approach was continued with visual reference to the runway with the first officer calling out airspeeds, the last of which he recalled was 105 knots. After a normal flareout the touchdown occurred, according to the crew, approximately 1,000 feet down the runway. The landing was described as, "... a little harder than usual." The aircraft configuration at touchdown was landing gear down, landing lights extended and on, flaps fully extended (50 degrees), and all propellers set at 2300 r.p.m.

The captain stated that immediately after landing, the aircraft entered a fog condition which reduced visibility to zero. Upon losing visual reference, he started to apply power but hesitated with the power application when sight of the runway lights was momentarily regained. However, almost immediately the aircraft again entered a dense fog and a go-around was initiated. The captain said, " .. at this point I started to apply full power and I called for full power and flaps to 20 (degrees), and I initiated go-around procedures. I rotated the airplane at V_2 (100 knots). We were approximately at V_2 when I started to apply power, and at V_2 I rotated the airplane and became airborne."

The first officer stated that upon the captain's command for "full power and flaps to 20" he reached across the pedestal, placed the master propeller control lever in the full forward position then moved the flap selector control handle to the 20-degree detent.

The second officer stated that he had reached forward with his left hand for the propeller master control but found it had already been placed in the high r.p.m. position. He then monitored the Brake Mean Effective Pressure (BMEP) gauges and noted they were all reading approximately 200 BMEP. 6/

A short time after the aircraft became airborne the captain heard the check pilot exclaim, "... you are sinking, pull up." The captain stated that at this time "I ... was very preoccupied trying to maintain my hundred knots, which was V_2 climbout speed, trying to maintain heading and attitude of the airplane, and it was shortly after this that we heard this noise, which is very hard to describe ... it was not a severe impact of any kind, although it felt that we either brushed something or touched something or hit something. It did not appear to be too solid. We were airborne and the airplane was not performing at all. It was merely maintaining its altitude and I did not dare let go of what I had. I maintained as closely as I could my attitude and my speed and eventually the airplane started to climb out."

6/ Normal go-around power is 2700 r.p.m. and 200 BMEP.

Full power was utilized during the climbout until the aircraft was on top of the fog estimated to be approximately 350 - 400 feet m.s.l. The captain stated that as the aircraft accelerated to V_2 plus 20 (120 knots) and at an altitude of approximately 500 feet he called for "... gear up" and then called for "... METO 7/ power and flaps up." The airspeed then increased to 135 knots.

The first officer stated that the command for, "gear up, flaps up" was given by the captain subsequent to the "noise" or "lurch" at about the time he was in contact with the tower to advise of the missed approach. He stated that upon this command he raised the landing gear handle from the down to the up position and then raised the flaps from the 20 degree detent to the full up position.

During the climbout, the check captain observed the No. 2 engine oil pressure warning light came on and the No. 2 engine tachometer indicating less than 1,000 r.p.m. He thereupon gave the command to feather the No. 2 propeller. The second officer responded to this command by engaging the No. 2 feathering switch. (Damage which had occurred but of which the crew was not aware, precluded any feather action taking place.)

A clearance to Lockheed Air Terminal, Burbank, California, was then requested and obtained by the flight. While en route to Burbank the check pilot and second officer visually inspected the aircraft from the cabin and reported to the captain that the No. 2 propeller was missing, and the No. 2 engine nacelle was drooped.

The flight then advised the WAL dispatcher through company radio of the damage to the aircraft and that the flight was proceeding to Burbank. It was also requested that the Los Angeles tower be advised that the aircraft's No. 2 propeller was on runway 25L.

At 2347, the flight established contact with Burbank Approach Control and received vectors to the Burbank ILS final approach course to runway 7. The Burbank weather was given as clear, visibility five miles, smoke and haze, wind calm.

Following a landing gear check by the Burbank tower a visual approach was made to runway 7 and the aircraft was landed without further incident at 0005 on December 18, 1963.

Examination of the aircraft revealed that the No. 2 engine nose case and propeller assembly 8/ had separated from the engine at the forward section of the front power case. Four of the six engine attach mounts were separated from

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7/ METO - Maximum Except Takeoff

8/ The No. 2 engine nose case and propeller assembly were recovered on runway 25L at Los Angeles International Airport approximately 6,400 feet beyond the runway threshold.

the mounting and the forward section of the engine drooped at an angle of approximately seven degrees.

The No. 1 engine cowling and propeller dome spinner were damaged by propeller fragments. All three blades of the No. 1 propeller were bent slightly forward and approximately 1/2 inch of the tips were ground off. Blade angles at impact, determined by shim plate markings, were approximately 33 degrees. Low pitch setting is 30 degrees.

The No. 2 engine propeller assembly was heavily damaged by impact. Propeller blade angles at impact, determined by shim plate marks, were 36, 33, and 36 degrees for blades Nos. 1, 2, and 3 respectively. The propeller governor was separated from the nose case and received minor impact damage. It was at the takeoff setting of 2700 r.p.m.

The left main landing gear doors were abraded on the outer and inner panels. The inboard wheel hydraulic brake line of the left main landing gear was separated from the manifold at the fitting. There was no damage to the nose gear or right main landing gear assemblies.

No abraded areas were found on the fuselage undersurfaces or on the tail skid.

There was no evidence of malfunction or failure of the aircraft or any of its components prior to impact.

Runway 25L at Los Angeles International Airport is 12,000 feet long and 200 feet wide, with a displaced threshold 9/ 650 feet west of the approach end. The ground elevation at the approach end of the runway is 91.4 feet and the effective runway gradient is ± 0.27 percent.

A standard configuration "A" approach lighting system with sequenced flashing (strobe) lights is installed for this runway. High intensity, directional, runway lights parallel both sides of the runway, 10 feet outboard of the runway edge, and spaced 200 feet apart.

At the time of the accident all components of the approach and runway lighting systems were on and operating at their highest intensity setting (step 5). The runway lights were positioned to the east.

The published ILS approach minimums for runway 25L were 200 feet ceiling and

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9/ The threshold is displaced 650 feet to the west in order to provide proper approach clearance for aircraft above ground obstacles located near the approach end of the runway.

1/2 mile visibility or 2,400 feet Runway Visual Range (RVR). 10/

The USWB at Los Angeles International Airport recorded a local weather observation of 2340, approximately at the time Flight 221 was inbound from the outer marker. This observation was: Sky partially obscured; surface visibility 3/4 mile, tower visibility 1/2 mile, ground fog and smoke; temperature 47°F., wind south-southwest 4 knots, altimeter setting 30.11 inches. In the remarks section of this observation the following was recorded: Runway 25L visual range 5,000 feet, runway 07 runway visibility less than 3/16 of a mile, runway 24 runway visibility less than 3/16 of a mile runway 06 runway visibility less than 3/16 of a mile, fog obscuring 4/10 of the sky, surface visibility 3/4 of a mile.

The USWB transmissometer record indicated that the RVR for runway 25L went below 6,000 feet at approximately 2338. From 2340 to 2345 the RVR varied between 5,000 and 6,000 feet. At 2347, six minutes after the accident occurred it dropped to less than 1,000 feet.

Tire marks and propeller slash marks made by N93131 were found on runway 25L as was the No. 2 engine nose case and propeller assembly. The initial impact tire marks, made by the left main landing gear outboard tire started at a point 5,430 feet beyond the displaced threshold and 14 feet 10 inches from the south edge of the runway. This mark was heavy at the beginning and continued for approximately 167 feet gradually decreasing until the mark disappeared completely. The inboard tire of the left main gear touched down 2 feet 7 inches beyond the outboard tire and left a moderate mark for 14 feet. Tire marks from the right main landing gear were found approximately 57 feet beyond the initial impact point of the left main landing gear. These marks continued for approximately 17 feet.

10/ RVR is an instrumentally derived value that represents the horizontal distance a pilot will see down the runway from the approach end, it is based on the sighting of either high-intensity runway lights or on the visual contrast of other targets, whichever yields the greatest visual range.

The primary instrument used to determine RVR is the transmissometer. It consists of a projector, a detector, and a meter to indicate the transmission of light through the atmosphere. The projector directs a steady light beam of constant intensity toward a photoelectric detector a known distance away. The intensity of the light received at the detector is dependent on the degree to which the path between the projector and detector is obstructed by atmospheric conditions. It is measured by the detector as a percentage of the amount of light that would be received in a clear atmosphere. A meter converts this transmissivity into a measure of visibility which is extrapolated into RVR values of up to 6,000 feet.

Initial propeller slash marks from the No. 2 engine were found on the runway starting at a point 5,489 feet beyond the displaced threshold, or approximately 59 feet beyond the tire marks left by the left main landing gear. These slash marks continued for a distance of 48-1/2 feet. The impact point of the No. 2 engine propeller and nose case was approximately 11 feet beyond the last slash mark made by this propeller. These components were found on the runway 850 feet beyond this point.

Propeller slash marks from the No. 1 engine started from a point 5,522 feet beyond the displaced threshold and continued for approximately 114-1/2 feet.

There was no evidence that any part of the aircraft other than the Nos. 1 and 2 propellers and both main landing gears made contact with the runway.

The aircraft's ground speed at impact was computed from the measured distance between propeller slash marks. To preclude any error due to the possible slowing of the propeller r.p.m. between the first and last propeller marks, only the measured distance between the first three slash marks of each propeller was used. Ground speed obtained from the computations taken from the No. 2 propeller slash marks was 126.3 knots. The No. 1 propeller marks indicate a ground speed of 127.4 knots.

The aircraft's longitudinal attitude at impact could not be determined. However, with minimum contact of the No. 2 engine propeller on the runway, the geometrical dimensions of the DC-6B aircraft are such that a maximum noseup attitude of approximately five degrees could be obtained without the tail skid making contact with the runway. Propeller contact with the runway as occurred could not have been obtained with the main landing gear in the fully extended and locked position without prior structural damage to the gear.

A lateral attitude at impact of approximately six degrees left wing down, was computed by comparing the relationship between the propeller tip path planes of the No. 1 and 2 propellers, with respect to the seven-degree dihedral of the wing.

The computed landing gross weight of the aircraft at Los Angeles was 79,993 pounds with a c.g. of 21.9 percent Mean Aerodynamic Chord. Both within operating limitations.

Aircraft performance, as outlined in the DC-6B performance curve, was examined by the Board to determine the climb characteristics of the DC-6B in a similar configuration to N93131 at the time of the go-around. It was shown that at a gross weight of 80,000 pounds at sea-level on a standard day, flaps extended 50 degrees, landing gear down, takeoff power on all four engines (2700 r.p.m. - 200 BMEP), and an indicated airspeed of 100 knots, a 725 feet/minute rate of climb could be expected.

Testimony concerning the DC-6B performance and acceleration characteristics in various configurations was obtained from the chief pilot of the Douglas Aircraft Corporation. It was stated that with takeoff power and the aircraft in a go-around configuration, as outlined above, the level flight acceleration would

be 1.4 knots per second. This acceleration would be slightly faster while the aircraft was on the ground. As the flaps transitioned from 50 degrees to 20 degrees, acceleration would increase to approximately 3 knots per second.

It was also stated that under these same go-around conditions, with 50 degrees of flap extended, an initial aircraft rotation of approximately five degrees would be necessary to establish a positive rate of climb. As the flaps were retracted to the 20-degree position an additional three degrees, or an angle of attack of approximately eight degrees, would be required to maintain the positive climb rate.

The landing gear and flaps are hydraulically operated by a constant pressure system with an operating pressure range of 2,600 to 3,050 p.s.i. This pressure is maintained by two engine-driven hydraulic pumps. With both pumps operating, the flap retraction time from 50 to 20 degrees is approximately seven seconds; landing gear retraction time is approximately eight seconds. The landing gear actuation sequence is such that the nose landing gear is the first to respond after selection to the retract or extend position.

Procedures to be followed for a go-around from a normal approach (gear down, flaps 50 degrees, all engines operating) in effect at the time of the accident were set forth in two company manuals. 11/

On November 14, 1963, WAL Flight Operations Memorandum (No 63-27) was disseminated to all flight personnel. This memorandum changed the duties of the first officer and second officer with respect to throttle handling during takeoff, and gear retraction and extension for takeoff and landing. The applicable section of this memorandum is as follows

"4. Throttle Handling During Takeoff

In application of power during takeoff, the second officer instead of the first officer will follow up on the right-hand set of throttles (or left-hand throttles if the airplane is being flown from the right) and will make the final adjustment and setting in accordance with the command received ...

5. Gear Retraction and Extension

Hereafter, the retraction and extension of the landing gear will be handled by the first officer instead of the second officer. This will standardize gear and flap handling in all three pieces of equipment. In the DC-6B, this change will serve to equalize the work loads of the first and second officers especially during emergencies.

11/ Go-around procedures listed in the WAL Pilots Manual, dated March 1963, were in part

1 Apply necessary power and attain best climbing speed ...
2. Retract the wing flaps to the 20° takeoff flap position.
3. Raise the landing gear as quickly as possible after obtaining a positive rate of climb.

The go-around procedures outlined in the WAL DC-6B Airplane Manual, dated July 20, 1954, were in part.

a. Apply full necessary power and attain best climbing speed ...
b. Raise the landing gears.
c. Retract the wing flaps to the 20° takeoff position.

Note Until the flight crews become accustomed to the changes in procedure in items #4 and #5 the captain should brief his crew prior to takeoff (a) second officer on command will set power, (b) first officer on command will retract and extend gear."

The captain did not brief the crew for Flight 200/221 regarding these changes in procedures.

Analysis

It was determined that Flight 200/221 was properly dispatched in accordance with company procedures. The crew had been well briefed regarding the weather conditions that were expected at Los Angeles

Observations taken by both tower and UWSB personnel were in accordance with current procedures. It was on the basis of these observations that the airport remained above published minimums throughout the approach. However, it is considered that the prevailing visibility of 1/2 mile, which was reported to the flight, and the RVR value of 5,000 feet were not truly representative of the actual visibility conditions experienced by Flight 221 along runway 25L. Although the RVR (for runway 25L) remained above 5,000 feet throughout the approach of the flight, it must be noted that this value was only representative of the transmissivity of the atmosphere over the 750-foot baseline of the instrumentation which is at the approach end of that runway. It was not representative of the fog-induced non-homogeneous conditions which existed beyond the approach end of the runway. Similarly, the area of thick patchy fog was beyond the visual range (1/2 mile) of the observer in the tower and was therefore, not detectable from his location. The pilot's actual "visual range" probably varied from the 5,000 feet reported, to close to zero in patches of fog.

During the approach to runway 25L the crew sighted the runway lights when the aircraft was in the vicinity of the middle marker. The dense fog condition which existed beyond the pilot's forward visibility range would not have been discernible at this point, nor would it have been discernible to the crew subsequently during the flare and landing transition. The weather information received by the flight from approach control as well as the captain's observations of adequate runway visibility indicated that the weather conditions were within the regulatory parameters which permitted landing and warranted continuation of the approach to touchdown.

It is to be noted, in light of these conditions, that the crew's visual acuity would have been enhanced had the landing lights been extinguished at touch down thereby eliminating the resultant glare.

It was indicated by the crew that touchdown was effected approximately 1,000 feet beyond the runway threshold However, computations based on applicable performance data give an average acceleration of 2.2 knots/second and elapsed time of 11.8 seconds, from lift-off (100 knots) to initial impact (126 knots), and result in a lift-off point approximately 3,250 feet beyond the runway threshold Thus, based on this lift-off point and on crew testimony regarding elapsed time between touchdown and the initiation of go-around procedures it is indicated

that touchdown actually occurred between 2,000 and 2,400 feet beyond the runway threshold.

As was shown in the performance manual, the DC-6B is capable of a 725 feet/min. climb while in the landing configuration, utilizing takeoff power on all engines, and maintaining 100 knots indicated airspeed.

In order to establish a climb from a level attitude on the runway, with takeoff power applied for a go-around, and flaps extended 50 degrees, a five-degree noseup rotation of the aircraft is required. As the flaps are retracted from the 50-degree to the 20-degree position an additional three-degree rotation, or approximately eight-degree noseup attitude is required to maintain climb.

As was evidenced by the absence of tail skid contact with the runway, the longitudinal attitude of the aircraft was less than five degrees noseup at impact. It is concluded, therefore, the aircraft was not rotated a sufficient amount to maintain a positive rate of climb during or after the transition of the flaps to the 20-degree position.

It was concluded that the landing gear was in the process of retraction at the time the aircraft settled onto the runway with its Nos. 1 and 2 propellers. Had the landing gear been in the down and locked position the aircraft, in all probability, would have bounced off the runway and continued the climbout with little or no damage incurred.

According to the crew, landing gear retraction was not called for, nor was the landing gear handle placed in the up position until after the impact had occurred. However, design specifications of the aircraft are such that propeller contact as occurred in this instance would not be possible with the landing gear extended and locked without prior damage to the gear. Therefore, the Board can only conclude that the landing gear handle was, in fact, placed in the retract position shortly after initial lift-off for the go-around by either the first or second officer.

Because there were conflicting company procedures in effect regarding the sequence of landing gear and flap retraction during go-around, it is possible that a lack of crew coordination and understanding concerning these procedures existed. This was further demonstrated in that the first officer assumed the duties of the second officer during the go-around by placing the r.p.m. control forward prior to retracting the flaps to 20 degrees.

Operations Memorandum 63-27, issued approximately one month prior to this accident, placed the responsibility of landing gear extension and retraction on the first officer and the setting of engine power on the second officer. It stated that a briefing concerning these changes in crew duties should be given by the captain prior to takeoff.

Because the memorandum had only been in effect a short time plus the fact that the crew was operating together for the first time, it is believed that a briefing by the captain outlining the changes in duties should have been conducted prior to this flight.

Probable Cause

The Board determines the probable cause of this accident was the failure of the pilot to maintain a positive rate of climb and the premature retraction of the landing gear during a go-around in fog conditions.

Recommendations

As a result of the accident investigation involving Eastern Air Lines Flight 512, DC-7B, N815D, which occurred at Idlewild International Airport, New York, on November 30, 1962, the Board made the following recommendations to the Administrator relating to the methods of observing and reporting runway and prevailing visibilities

1. It was recommended that the Air Traffic Control procedures require the transmission of all operationally significant weather information in terminal areas to approaching aircraft. The FAA by letter dated January 8, 1963, stated that the necessary procedural changes were being prepared.

2. It was recommended that an alternative method be developed to determine runway visibility when the RVR is inoperative. This was to be accomplished by utilizing runway observers certificated by the Weather Bureau. On January 14, 1963, the FAA stated that this procedure would be implemented on a trial basis in New York, Chicago, and Los Angeles. The Weather Bureau indicated concurrence with the recommendation on January 8, 1963

3. It was recommended that the Weather Bureau amend their methods of observing and reporting prevailing weather where "partial obscurations" are present. The Weather Bureau indicated concurrence with this recommendation on January 8, 1963.

4. It was recommended that the "Remarks" portion of weather reports be broadcast to aircraft. The FAA informed the Board that a priority project had been initiated to standardize the transmission of weather information from ATC facilities to airmen in flight.

5. It was recommended that the RVR instrumentation in the recently commissioned IFR room of the Idlewild Tower was inadequate. Also, the Board requested a study of the physical arrangement in all towers where PAR is installed. On January 11, 1963, the FAA stated that corrective action was being taken and that a new program would permit installation of five RVR indicators in a tower facility.

Both the Board and the Administrator are aware of the possible detriments to take-off and landing caused by unreported weather phenomena such as the thick patches of fog encountered by WAL Flight 221 after touchdown. It is recognized that non-homogeneous fog conditions when existing beyond an RVR installation or outside of the sphere of visual observation points used for determining prevailing visibility can, under the present methods of measuring visibility, remain unreported. However, as outlined in the FAA Advisory Circular ACC 00-13A, effective February 24, 1965, plans are now in effect to improve the "state of the art" in these areas. It is anticipated that in the future one or more

additional transmissometers may be located on other portions of the runway for the purpose of providing more representative reports.

Moreover, on airports equipped with one or more RVR installations, a ten-minute mean of RVR values of all runways reporting RVR is contained in the hourly weather sequence reports. This is shown on the sequence report as a Visual Range and is given in feet. This value does not pertain to, nor control operations on any individual runway but is given as an information item to assist in the overall appraisal of airport conditions. It is anticipated that the highest and the lowest one-minute value recorded during this period will also be given, together with the ten minute average.

Also, it is planned that RVR equipment will serve all runways equipped with an instrument landing system, and takeoff runways where deemed necessary. All presently installed Runway Visibility Systems will be converted to Runway Visual Range Systems as soon as computers and digital readout equipment become available.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD
Chairman

/s/ ROBERT T. MURPHY
Vice Chairman

/s/ G. JOSEPH MINETTI
Member

/s/ WHITNEY GILLILLAND
Member

CHAN GURNEY, Member, did not take part in the adoption of this report.

SUPPLEMENTAL DATA

Investigation

The Civil Aeronautics Board was notified of this accident at approximately 0055 P.s.t., December 18, 1963. An investigation was immediately initiated in accordance with provisions of Title VII of the Federal Aviation Act of 1958, as amended. Depositions were ordered by the Board and were taken at Los Angeles, California, on December 19, 1963, and January 21, 1964

Air Carrier

Western Air Lines, Inc., is a scheduled air carrier incorporated in the State of Delaware with its principal business office located in Los Angeles, California. It operates under a currently effective certificate of public convenience and necessity issued by the Civil Aeronautics Board, and an air carrier operating certificate issued by the Federal Avaition Agency. These certificates authorize the company to transport by air, persons, property, and mail between various points in the United States, Mexico, and Canada.

The Aircraft

N93131, a Douglas DC-6B, manufacturer's serial No. 45536, was owned and operated by Western Air Lines, Inc., 6060 Avion Drive, Los Angeles, California. The aircraft was manufactured in August 1958, and had a total flying time of 13,742:40 hours.

It was powered by four Pratt & Whitney model R-2800-CB16 engines and equipped with Hamilton Standard model 43E60 propellers. Engine times are as follows:

Engine Position	Serial No.	Time Since Overhaul	Total Time
No. 1	37158	841	9,436
No. 2	36045	103	13,171
No. 3	34424	189	16,538
No. 4	35809	324	13,008

Flight Personnel

Captain Robert P. Elliot, age 40, was employed by WAL on February 15, 1950. He held currently effective FAA airline transport certificate No. 116363 with type ratings for the DC-6B and DC-7 aircraft. Captain Elliot had a total of 15,200 hours flight time of which 5,000 hours were in DC-6B type aircraft. He satisfactorily passed a first-class FAA flight physical on December 12, 1963, without waivers Captain Elliot was requalified as pilot-in-command in DC-6B aircraft on November 21, 1963. The subject flight was his first as pilot-in-command since June 1960.

First Officer Lee N. Marshall, age 32, was employed by WAL on February 27, 1961. He had a total of 2,200 hours flight time of which 750 hours were in

DC-6B aircraft. He held currently effective FAA commercial certificate No. 1431905 with aircraft single and multiengine land, and instrument ratings. He satisfactorily passed a first-class FAA flight physical on June 26, 1963, without waivers. His last proficiency check in the DC-6B was on October 1, 1962. His last line check in a DC-6B was on September 20, 1963.

Second Officer Dennis J. Gibbons, age 26, was employed by WAL on May 9, 1963. He had accumulated a total of 360 hours as flight engineer of which 344 hours were in DC-6B aircraft. He held currently effective FAA flight engineer certificate No. 1556780, and he also held commercial certificate with single and multiengine land aircraft and instrument ratings. He passed a second-class FAA flight physical on May 3, 1963, without waivers. His last line check was in a DC-6B aircraft on October 9, 1963.

Captain Luke V. Sonner, Jr., age 43, was employed by WAL on June 24, 1946. He had accumulated a total of 14,600 hours flight time of which 8,000 hours were in DC-6B aircraft He held currently effective FAA airline transport certificate No. 424086 with numerous ratings, among which was the Douglas DC-6B. He satisfactorily passed a first-class FAA flight physical on October 17, 1963, without waivers. His last line check in a DC-6B was on March 14, 1963. His last proficiency check in a DC-6B aircraft was on March 27, 1963. Captain Sonner was a designated check pilot from July 1, 1959 to October 1, 1959, and from February 1, 1960 to the date of the accident.

Stewardess Donna J. Rafferty was employed by WAL on July 4, 1957. She completed recurrent training in emergency procedures on all equipment November 14, 1963.

Stewardess Diane Leavens was employed by WAL on July 21, 1961. She completed recurrent training in emergency procedures on all equipment November 20, 1963.