

## CIVIL AERONAUTICS BOARD

**ACCIDENT INVESTIGATION REPORT**

Adopted: April 10, 1958

Released: April 16, 1958

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EASTERN AIR LINES, INC., MARTIN 404, N 492A,  
RICHARDS FIELD, MASSENA, NEW YORK, NOVEMBER 14, 1957

The Accident

At 1520<sup>1/</sup> on November 14, 1957, Eastern Air Lines Flight 18 made a hard landing at Richards Field, Massena, New York. The two passengers and three crew members were uninjured. The aircraft, a Martin 404, N 492A, received major damage.

History of the Flight

Eastern Air Lines Flight 18 is a scheduled operation serving the carrier's route between New York City and Massena, New York, and its intermediate stops at Albany, Plattsburg, and Malone, New York. On November 14, at 1245, the flight originated on schedule, its flight crew consisting of Captain Joseph W. Harpham, First Officer Robert Casper and Flight Attendant Nancy A. Price. The flight followed routine preparation and was in accordance with an IFR (Instrument Flight Rules) flight plan. The general weather conditions over most of the route were forecast to be good.

The flight proceeded through the intermediate stops in a routine manner, with most passengers deplaning at Albany and Plattsburg. Just prior to reaching Malone the instrument flight plan was canceled in good weather conditions. The flight landed at Malone at 1502.

Continuing uneventfully, Flight 18 departed Malone at 1510. The gross takeoff weight of the Martin 404 was 35,977 pounds, 8,923 pounds under the maximum allowable. According to the load manifest the load was properly distributed within the center of gravity limitations. The first officer made the takeoff, climbed the aircraft approximately 2,500 feet, and flew it to Massena. Captain Harpham, from his left seat, supervised the flight and performed the duties of copilot.

At 1516, when about eight miles east of Richards Field, Captain Harpham reported the flight's position, then asked for and received landing information, which included the surface wind as "northeast 5 to 10 knots," and the active runway 4 (150 feet wide and 4,000 feet long). First Officer Casper established a downwind leg at 1,200 feet to execute a rectangular left-hand pattern for landing on runway 4.

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<sup>1/</sup> All times herein are eastern standard and are based on the 24-hour clock.

The flight was viewed briefly by ground observers during the pattern before reaching the final landing approach and it seemed entirely normal. As the aircraft drew closer to the threshold it seemed high and thereafter assumed an abnormally steep descent. As it approached the runway surface the aircraft assumed a flareout attitude; however, the rate of descent continued with little visible abatement. Consequently, N 492A contacted the runway surface with great force at which time the right powerplant separated from the aircraft. The aircraft rebounded and again contacted with great force. It then rolled forward and gradually off the runway to the right. Before stopping it crossed a taxiway and the left powerplant fell free, accompanied by a small fire in the engine and the empty nacelle area.

As the aircraft stopped Captain Harpham shut off the fuel and electrical services and ordered the loading ramp lowered. The passengers and crew quickly evacuated by this exit without difficulty or reported injury.

At 1522, two minutes after the accident, weather conditions were reported as: Ceiling 4,000 feet broken, 10,000 feet overcast; visibility 3 miles; haze; wind northeast 6 knots.

### Investigation

Investigation on the scene revealed that N 492A initially contacted the runway 455 feet beyond the approach end and 55 feet inboard of the right edge. The contact was evidenced by prominent marks from the right main tires and indentations in the asphalt surface of the runway made by the right main outboard wheel. The tire marks were apparent for the next 36 feet and were in general alignment with the runway heading. Within the tire marks there were three propeller cuts in the runway made by the right propeller blades. To the left, slightly beyond and parallel to these cuts, were three similar cuts inflicted by the left propeller blades.

Eyewitness observations, crew testimony, and the absence of marks on the runway, revealed the aircraft then rebounded and was airborne for the next 580 feet. During this time the right powerplant separated, fell free, and tumbled to the right side of the runway and stopped about 400 feet beyond the initial contact. Tire scuff marks and additional wheel indentations marked the second runway contact. Thereafter rubber marks showed the path of the aircraft as it rolled gradually toward the right edge of the runway and overran it 1,350 feet beyond the approach end. The Martin continued to a stop at a location 169 feet to the right of runway 4 and 2,350 feet past the approach end. The left powerplant fell off just before the aircraft stopped.

High inertia forces tore out both powerplants. These forces caused the upper engine support struts to fail in tension and the lower struts in twisting and buckling. Fuel and oil which flowed from broken lines was ignited in the case of the left engine, causing the fire which occurred.

The outer skin and internal structure between fuselage stations 280 and 311 were cut and torn. This damage was inflicted by the No. 3 blade of the right propeller after the propeller struck the ground and the blade was torn from its hub and hurled into the fuselage.

The front wing spar, including the cap and web, failed at station 120. This damage was the result of deceleration forces imposed on the structure during the severe runway contacts. There was no evidence of material weakness.

Damage found in the left engine nacelle area and to the left wing center section structure showed the aircraft had rolled over the left powerplant, with some damage in these areas being the result of strikes by the blades of the left propeller.

Examination showed the landing gear was extended, locked down, and undamaged. The main gear tires remained inflated; however, areas of flattening on the right outboard wheel rim revealed its tire had been subjected to maximum deflection, permitting the wheel to contact the runway. Indentation in the runway surface which matched the flattened areas on the rim showed this maximum tire deflection occurred at both the initial and secondary touchdown points. The nosewheel tire was blown. The landing gear shock struts were in good condition and properly serviced.

The wing flaps were extended equally to the landing setting, 45 degrees; however, they had received major damage, apparently from contacts with the separated powerplants. The left flap hinges at stations 55 and 120 were sheared from the spar.

As a result of the examination, all damage to the aircraft was determined to have resulted from high inertia forces associated with the hard landing and from contacts between the aircraft and the separated powerplants. Both Captain Harpham and First Officer Casper substantiated this determination by stating that there was no malfunctioning of the aircraft before impact. Describing the severity of the runway contact, Captain Harpham said it was so hard that he was momentarily stunned.

The captain testified that when he reported in range and received landing information, he recalled the prior landings at Plattsburg and Malone were according to a southwest surface wind, contrary to the reported wind at Massena, "north-east 5 to 10 knots." He mentioned this to the first officer. On the downwind leg, however, the captain noted smoke from an industrial plant near the airport which confirmed the Massena wind direction as reported. The in-range checklist was completed and the downwind leg was flown in a normal manner. The aircraft was slowed, after which takeoff flap was extended and the landing gear lowered and checked.

The pilots stated that a left turn to base leg was made about 800 feet above the ground and at a normal airspeed of about 130 knots. Captain Harpham said that during and after the turn he noted the presence of an overriding wind which drifted the aircraft somewhat closer to the airport. He added that this wind situation was related as a factual observation and not as a factor in the hard landing. Investigation revealed that a southwest wind did exist which was overriding the northeast surface wind. Velocity of the southwest wind was approximately 20 knots above 500 feet.

The pilots said the left turn to final approach was made using a normal bank. It was executed approximately 500 feet above the ground with an airspeed of about 120 knots. Approach flap was added during the turn. On completion of

the turn the aircraft was well aligned with the runway. Neither pilot was able to give the distance to the runway; however, at 450 feet above the ground the airplane seemed high in consideration of the distance. First Officer Casper said that at this time he intended to ask permission to go around; however, before he asked, Captain Harpham took control of the airplane. The captain said that he felt he should take control but that he believed he could continue and land without difficulty.

Captain Harpham testified that the technique he employed in continuing was to immediately close the throttles and apply full landing flap with the right hand. Concurrently he applied back pressure to the yoke with his left hand and slowed the airplane to about 95 knots. He stated that it was his intention to slow the aircraft, then to lower the nose, getting as much descent as possible over the distance and at the same time increase the airspeed to about 110 knots to assure an adequate airspeed for the flareout and touchdown. Responding to questions, the captain said that his technique resulted in an abnormally steep nose-down attitude and high rate of descent. He stated that without power and in landing configuration he doubted if the airspeed increased for the flareout as he had planned. Consequently, when he began the flareout these factors resulted in the rate of descent continuing with little abatement until the runway was contacted. The captain said that he added some power during flareout but with the runway rapidly approaching this was psychologically hard to do and was the reason he did not add more. The captain stated that in his opinion it was the technique he employed before reaching the flareout position that resulted in the hard landing rather than the flareout timing or use of control in the flareout.

Questioned concerning his training to qualify as captain on the Martin aircraft, Captain Harpham recalled that it included the "high-altitude approach." This maneuver is one used to descend as quickly as possible over the shortest distance. It would be appropriate during an approach to a runway from a high, close-in position. He said that the proper conduct of this maneuver requires slowing the aircraft to 100-105 knots in the landing configuration (full landing flap, and gear extended). It then requires the maximum descent obtainable maintaining the airspeed and carrying no less than 15-18 inches of manifold pressure until reaching the flareout position. The captain said that during training this maneuver was demonstrated to him and he had flown it. The captain stated that during the Massena approach he used no power and less airspeed than 100-105 knots, both of which were contrary to the prescribed technique for the maneuver. When asked, however, he added that 100-105 knots and 15-18 inches of power had not been indicated as being limits to the maneuver.

The Chief of Pilot Training from Miami, the principal training center for Eastern Air Lines, testified that had Captain Harpham used no power and less than 100-105 knots in the high-altitude approach during training, he certainly would have been warned against it. He stated that the company taught the maneuver as it was to be executed and described situations where it would be applicable. He indicated that while limits to the approach technique were probably not specifically stated, the attitude of the aircraft and rate of descent obtained as the maneuver was taught should prompt the pilot not to go beyond this technique. The Chief of Training said that, nevertheless, since this accident and another nearly identical to it, a decision had been made to publish written material warning pilots against a completely power-off approach. This material, he said, would not only be applicable to the operation of the Martin 404 but to all of the carrier's equipment. He said this material would become part of the flight manual for each type aircraft.

### Analysis

It is clearly evident that the principal damage to N 492A was the result of high forces induced by contacting the runway at an excessive descent velocity. It is equally clear that these forces exceeded the design strength of the aircraft structure. Other damage occurred in the sequence of events when the aircraft passed over and contacted the separated powerplants and when the propellers cut and tore the aircraft structure.

The Board concurs with Captain Harpham that the technique he employed after taking control from the first officer was faulty and precipitated the hard landing. In consideration of his experience and qualifications he should have realized that a considerably steeper nose-down attitude than normal and an abnormally high rate of descent would result from his technique. Knowledge of an approach maintaining 105 knots and 15-18 inches of power should have indicated to him that an approach resulting from this technique would be undesirable in standard air carrier practice. Further, if Captain Harpham did not know precisely the approach which would result from this technique, it was unwise to use it.

It is also the Board's view that company training did not fulfill its entire responsibility. The Board realizes that a training program cannot anticipate and cover every possible contingency or situation. Nevertheless, it is vital to formalize the safe operational limits of maneuvers such as the landing approach. In this situation, where the limits of airspeed and power retained were most important, they might well have been included as part of the training on the high-altitude approach. The previous accident which occurred under nearly identical circumstances, together with this one, would seem to emphasize the necessity and wisdom for such inclusion. Thus, the material added to the flight manuals cautioning pilots against a completely power-off approach appears to be essential under the circumstances.

### Findings

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

1. The carrier, the aircraft, and the flight crew were properly certificated.
2. The flight was properly dispatched and conducted in a routine manner to the area of Massena, New York.
3. The first officer operated the aircraft in the traffic pattern.
4. During the turn to the base leg and while on base leg, an overriding wind was allowed to drift the aircraft closer to the airport.
5. From a higher and closer than normal position on final approach, the captain took control of the aircraft and continued the approach.
6. The throttles were closed, landing flap was extended, and the aircraft was slowed to 95 knots.
7. The aircraft descended in an abnormally steep nose-down attitude and at a high rate of descent.

8. The altitude remaining was insufficient for the aircraft in its existing configuration to regain adequate flareout speed.

9. The flareout attitude was accomplished; however, the rate of descent continued with little abatement.

10. The aircraft contacted the runway with great force causing major structural damage.

11. Important limits in the approach technique were not included as part of company pilot training.

12. There was no malfunction or failure of the aircraft prior to the runway contact.

Probable Cause

The Board determines that the probable cause of this accident was the captain's incorrect technique during the final approach which resulted in an abnormally steep nose-down attitude and high rate of descent, the latter not being sufficiently arrested before touchdown.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

/s/ LOUIS J. HECTOR

## S U P P L E M E N T A L   D A T A

### Investigation and Taking of Depositions

The Civil Aeronautics Board was notified of the accident at 1555 November 14, 1957, through CAA communications. An investigation was immediately initiated according to the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. Depositions were ordered and taken in the Federal Building, New York International Airport, Jamaica, New York, on December 19, 1957.

### Air Carrier

Eastern Air Lines, Inc., is a Delaware corporation with its corporate offices located at New York, New York. The company possesses a currently effective certificate of public convenience and necessity issued by the Civil Aeronautics Board and an air carrier operating certificate issued by the Civil Aeronautics Administration authorizing the carriage of persons, property, and mail over the route on which the accident occurred.

### Flight Personnel

Captain Joseph W. Harpham, age 39, was employed by Colonial Airlines, (later merged with Eastern Air Lines) on March 27, 1946. He was promoted to captain July 1, 1955. Captain Harpham holds a currently valid airline transport rating and type ratings on DC-3 and DC-4, Constellation, and Martin 202 and 404 aircraft. At the time of the accident he had accumulated 11,870 flying hours, of which 535 were in the Martin 404. Captain Harpham completed transition training in the 404 on September 13, 1956. His latest line and instrument checks were satisfactorily accomplished on July 24, 1957, and August 9, 1957, respectively. His latest physical examination was satisfactory, without waivers, on July 5, 1957.

Pilot Robert Casper, age 31, was employed by the company on May 6, 1957. He holds a valid airman certificate with commercial and instrument ratings. He was trained by Eastern on the Martin 404 during May and June 1957. Pilot Casper had accumulated 738 flying hours at the time of the accident, of which 155 were in the equipment involved. His latest physical examination was current and satisfactory, without waivers.

Flight Attendant Nancy A. Price, age 21, was employed by the company in July 1957. She completed flight attendant training on July 20, which included appropriate training in evacuation and emergency procedures for the aircraft utilized by the carrier.

### The Aircraft

N 492A, a Martin 404, bore serial number 14240 and was manufactured November 26, 1952. It had a total operational time of 15,617 hours at the time of the accident. It had flown 21 hours since the last periodic service inspection. During these hours operation of the aircraft was reported normal and records showed all trip inspections were completed. N 492A was equipped with Pratt and Whitney R-2800-CB-3 engines and Hamilton Standard propellers, hub model 43E60-9, blade model 6895A-12.