



**AIRPLANE CRASH**  
Dallas/Fort Worth Airport, TX  
August 31, 1988



# **FIRE INVESTIGATIONS**

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FIRE INVESTIGATION REPORT

Delta Flight 1141 Crash  
Dallas/Fort Worth Airport  
August 31, 1988

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Publishers of the National Fire Codes® and National Electrical Code®

A non-profit membership organization dedicated to promoting safety from fire, electricity, and related hazards through research, codes and standards, technical advisory services, and public education since 1896.

## ABSTRACT

At approximately 9:00 a.m. on Wednesday, August 31, 1988, a Boeing 727 in service for Delta Air Lines crashed during takeoff at the Dallas/Fort Worth Airport. The plane experienced a low impact crash off the end of the runway and traveled 3300 feet along the ground beyond the end of the runway. It left a trail of burning fuel and grass, and the fuselage opened in some locations. Of the 108 persons onboard, 94 survived.

### I. INTRODUCTION

The National Fire Protection Association participated as an observer in the investigation of the crash by the National Transportation Safety Board. The NFPA's principal interest in the incident concerns the crash/fire/rescue performance, and the relationship between applicable NFPA standards and recommended practices that pertain to airport and aviation safety.

Martin F. Henry, Director of NFPA's Public Fire Protection Division arrived on site the day following the crash. Access to the crash scene and information collection activities were made possible through the cooperation of the National Transportation Safety Board and the Department of Public Safety of the Dallas/Fort Worth International Airport. The cooperation and assistance of these agencies is acknowledged and appreciated. Special thanks is offered to Gary Hammsek, Investigator for the National Transportation Safety Board; and to Wayne Sibley, Associate Director of the Department of Public Safety at the Airport.

## II. INCIDENT

Flight 1141, with a total of 108 persons onboard a Boeing 727 in service for Delta Air Lines, took off with what was considered a moderate load in weather that was mild and clear. The fuel load totaled 32,000 pounds (4776 gallons). As the aircraft traveled south down the 11,388-foot-long runway, it appeared to assume proper takeoff attitude, but it was not achieving normal altitude. It began to lift off at a point about 8500 feet down the runway. The tail of the plane reportedly struck the runway; the right wing dipped and may have touched ground at the edge of the runway. A correction to the left caused what was described as a rotating, or rolling, takeoff and the plane then came down, experiencing a low impact crash just off the end of runway 18L. (See Figure 1.)

The plane continued to move at a rapid but decelerating speed for more than 3000 feet, coming to rest at a chain link security fence on airport property. The crash and the subsequent deceleration occurred on hard, rough terrain that was relatively level except for some bumps and depressions.

Along the aircraft's path of travel, its right wing separated and broke apart, resulting in a trailing fuel and grass fire. The fuselage broke open in several places: immediately aft of the left main entry door behind the cockpit, and to the rear of the wing area. The cockpit section was twisted to the left, and the nose of the aircraft was at ground level.

It is reported that none of the passengers received incapacitating injuries from the impact or from the jarring journey across the grassy field. All of the passengers were able to leave their seats and begin an evacuation. Many left by the over-wing exits on the left side of the plane. Two went out the left front exit door, and many more left the aircraft through breaks in the fuselage. However, the three men in the cockpit crew were injured and dazed by the impact; they were immobile.

Radio transmissions over emergency response channels indicate that the first fire fighting apparatus responding to the alert reached the vicinity of the crash in about four minutes and twenty seconds. Shortly after its arrival, all of the passengers who were to survive the crash had managed to escape from the rapidly burning aircraft. A few passengers reported feeling foam spray droplets as they left. First arriving fire fighters reported that flames already had burned through the roof of the fuselage near the front of the plane. Fire also was visible in the breaks of the fuselage and the windows of the aircraft.

Ninety two people had managed to evacuate successfully; one of these passengers died from burns several days later. A total of 33 people among the 95 evacuees had to be hospitalized.

### Emergency Response

Airport emergency response personnel, including the fire service, the police and the emergency medical services, performed flawlessly at this incident. Crowd control was handled efficiently; the hospital alert plan was implemented successfully; two triage areas were established and medical assistance was provided as needed; and fire fighting and rescue efforts proceeded to a swift and successful conclusion. All necessary notifications were made, and off-duty personnel were summoned without any difficulties.

Emergency operations that proceed smoothly and efficiently are an obvious result of training and adequate planning. Those responsible for this state of preparedness are to be credited. Part of the reason for the readiness is attributable to a previous incident at the Dallas-Fort Worth Airport. Delta Flight 191 crashed on August 2, 1985, while trying to land during a thunderstorm. The incident resulted in the tragic loss of 132 lives, with only 30 survivors. Some of the same emergency responders were involved in operations at both crashes. Credit must be given in part to recommendations

made by the National Transportation Safety Board following that crash. The lessons learned from the first crash were put to beneficial use during the intervening three-year period.

Because the operation went so smoothly, many people are to be commended. To single out acts of heroism runs the risk of overlooking other equally deserving deeds. That caveat aside, however, two individuals' actions are worth describing, because they best exemplify the quality of the overall performance of all the emergency responders.

Fire Fighter Charles Charleston drove the first-to-arrive fire fighting apparatus, reporting on the scene in about four minutes and twenty seconds from the time of the receipt of the alarm. He was assigned to Unit 42, an M-15 apparatus that carries 4000 gallons of water and 515 gallons of aqueous-film-forming foam (AFFF). The unit is designed to be operated by one person.

When Charleston arrived, the plane's right side appeared to be totally engulfed in flames. He saw no evacuating passengers. He positioned the M-15 at the right side of the tail section and activated the turret monitor, delivering a 3 percent solution of low expansion foam. The stream was used to cover the fuselage with foam and to extinguish all visible flame. He then repositioned his apparatus near the front right side of the aircraft and continued delivering foam throughout the burning plane until his supply of water was exhausted. When this occurred, he sent the apparatus to a reservicing area where it would be refilled with water. Charleston then stretched a handline from Unit 22, another M-15 that had arrived and was operating its turret on the fire. He took the line up a ladder and into the interior, through a hole in the roof near the front of the craft, to continue extinguishment and to examine the interior.

Fire Fighter Charleston's timely and tireless actions were instrumental in achieving a rapid extinguishment and in preventing fire extension into the cockpit area where the crew was still trapped.

Officer Larry Wood was assigned to patrol rescue on the day of the incident. Members of the airport police are cross-trained to perform fire rescue responsibilities. Wood was attending a classroom training session at the time of the crash. Upon receipt of the alert, he responded in his patrol vehicle to the crash site, where he donned protective clothing. Extinguishing operations were under way. He was informed that the cockpit crew members were still inside the burning, smoke-filled plane.

Wood entered the aircraft by the left forward door and crawled into the cockpit, where he found the three crew members still in their seats. They appeared to be conscious, but dazed, and they were making no attempts to move from their positions. The pilot, whose head was bleeding, indicated that his back was injured and that he was unable to move.

During the rescue efforts, Wood reassured the pilot and the first officer that additional assistance was on the way. He advised the pilot to remain still. He was able to help the flight engineer out of his seat within the next few minutes and to lead him to the exterior of the plane. He then returned to the still smoky cockpit to resume his efforts to free the remaining two crew members.

He asked the first officer if he was able to move his hands and legs, and received an affirmative reply. Because of the tilted position of the cockpit, the arm of the first officer's seat interfered with his ability to raise himself out of the chair. Wood stretched his own body in a prone position over the cockpit control console and advised the first officer to lift the arm of his chair and roll out of the seat and onto Wood's body. The first officer succeeded in completing this maneuver. For a frightening moment, he remained motionless atop Officer Wood, pinning the rescuer in a helpless position.

Then with some effort, he slid along Wood's body toward the exit door. The rescuer followed and handed the first officer to other rescuers outside the plane.

After removing the first officer to the exterior, Officer Wood was completely exhausted from the strenuous efforts and he himself had to be assisted. By this time, the fire was substantially controlled, but acrid smoke remained a problem.

Other rescuers entered the cockpit and gave aid and reassurance to the pilot. Because of his back injury, the need for a backboard, and the cramped working space that hindered maneuverability, this rescue effort was prolonged, but after several minutes, the pilot was removed successfully.

The crash of Flight 1141 was certainly a tragedy. Fourteen people lost their lives, and dozens of others were injured and/or traumatized. Of the fatalities aboard the plane, seven passengers and two flight attendants were clustered at the unopened left rear emergency door.

#### Relevant Excerpts from NFPA 402M

NFPA 402M-1984, Manual for Aircraft Rescue and Fire Fighting Operational Procedure, contains the following sections that are particularly pertinent to this article:

2-1.1 Airport based fire fighting equipment should be available and located so that the demonstrated response time of the first responding fire fighting vehicle to reach any point on the operational runway is two minutes or less and any point remaining within the critical rescue and fire fighting access area is no more than a three minute response time whenever flight operations are in progress....

Definition: Critical Rescue and Fire Fighting Access Area. This is the rectangular area surrounding any given runway. Its width extends 150m (500



ft.) outward from each side of the runway centerline, and its length is 1000m (3300 ft.) beyond each threshold.

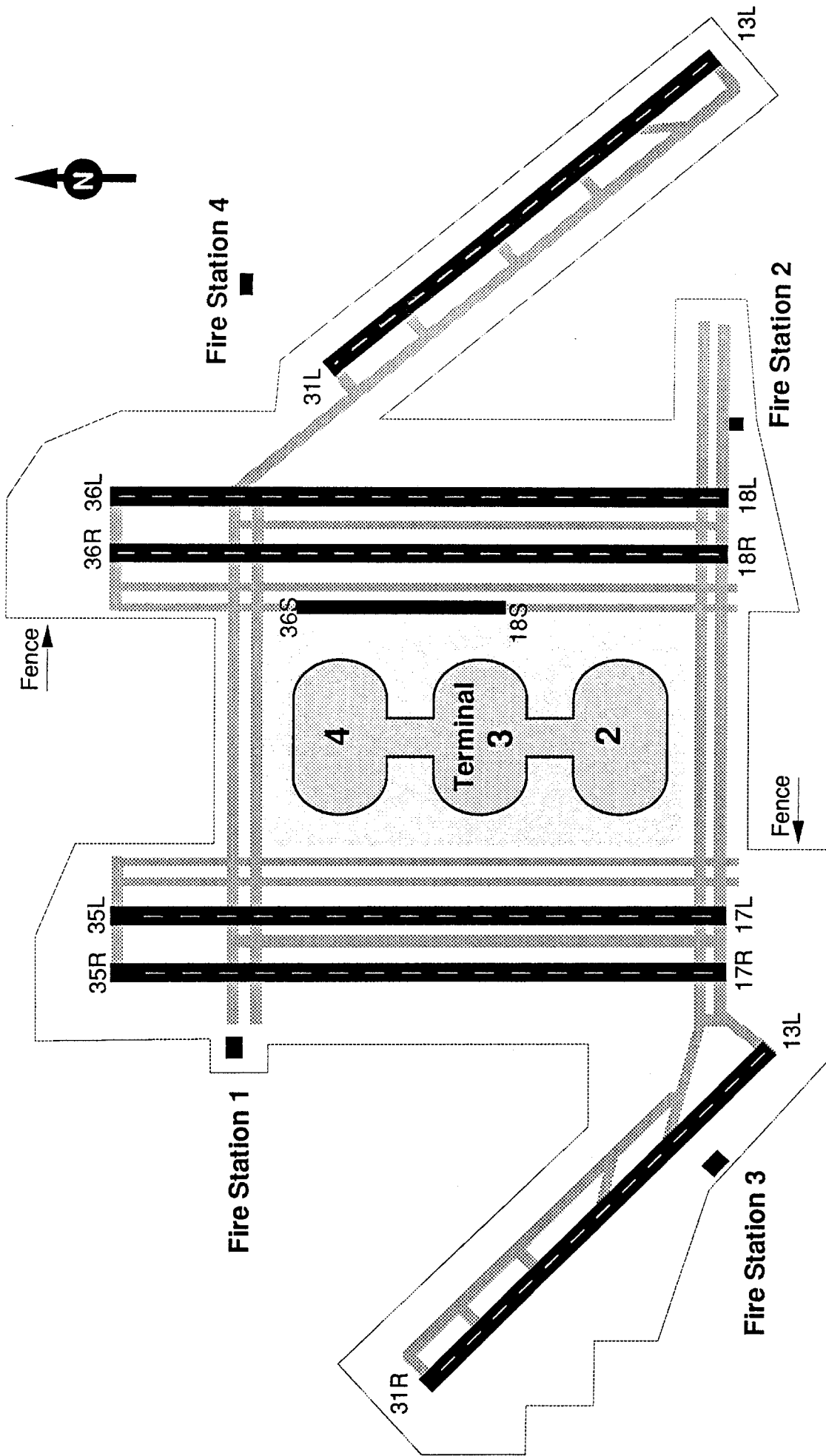
4-2.4 Alert III-Aircraft Accident. This alert denotes an aircraft accident has occurred on or in the vicinity of the airport. Regardless of the source of this alarm, full airport fire and rescue response procedures should be put into effect. ...

Despite the tragedy, many people concluded that the crash could have had far more serious consequences. Several favorable elements accounted for the fact that so many people survived.

Among them were the following:

1. The crash was one of low impact and the plane remained upright.
2. The size and configuration of the Dallas-Fort Worth Airport provided substantial room for over-run and deceleration.
3. None of the passengers were incapacitated by the impact.
4. Some of the fuel was expended when the right wing separated, diminishing the likelihood of a pool fire under the plane.
5. The fuselage opened in a fashion that permitted additional exit points and helped to provide additional ventilation of the interior.
6. Interior furnishings were of fire retarding material. Ignition within the aircraft did not take place immediately. Rapid and expert response by emergency services was also a major positive feature.
7. Fire suppression forces used 15,800 gallons of water and approximately 650 gallons of AFFF in extinguishment and overhaul operations.

The investigative report of the National Transportation Safety Board will examine every aspect of the accident and will respond to the unanswered questions that remain.



**Figure 1:**  
 Dallas-Ft. Worth Airport  
 Fire Station Location  
 and Approximate Crash Site

Approximate Final  
 Position of Aircraft