



# Aviation Investigation Final Report

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|                                |                                   |                         |                     |
|--------------------------------|-----------------------------------|-------------------------|---------------------|
| <b>Location:</b>               | Santa Ana, California             | <b>Accident Number:</b> | DCA22LA151          |
| <b>Date &amp; Time:</b>        | July 1, 2022, 17:21 Local         | <b>Registration:</b>    | N480WN              |
| <b>Aircraft:</b>               | Boeing 737-700                    | <b>Aircraft Damage:</b> | None                |
| <b>Defining Event:</b>         | Abnormal runway contact           | <b>Injuries:</b>        | 1 Serious, 141 None |
| <b>Flight Conducted Under:</b> | Part 121: Air carrier - Scheduled |                         |                     |

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## Analysis

A flight attendant was injured when Southwest Airlines Flight 2029 landed at the John Wayne-Orange County Airport (SNA), Santa Ana, California.

According to the flight crew, they were flying a visual approach to runway 20R at SNA. They were aiming for the touchdown zone due to its short runway and trying to fly the aircraft onto the runway with minimal floating. However, it ended up being a firm landing. Shortly after exiting the runway, the flight crew were informed that the “B” position flight attendant (FA) seated in the aft jump seat had injured her back on landing and required medical assistance. Data from the operator’s Flight Operations Quality Assurance (FOQA) and Aircraft Health Monitoring (AHM) programs indicated the landing did not meet the hard landing criteria set by the airplane’s manufacturer.

According to the FA, after securing the galley and cabin for landing, she sat down in her jumpseat, secured her seatbelt harness, and got into the brace position. She indicated that the plane hit the ground with such force that she thought the plane had crashed. She immediately felt pain in her back, neck and she could not move. Paramedics evaluated her and transported her to a local hospital where she was later diagnosed with a compression fracture to her T3 vertebra.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A flight attendant received a serious injury for undetermined reasons during a firm landing.

## Findings

|                         |  |
|-------------------------|--|
| <b>Aircraft</b>         | Landing flare - Unknown/Not determined |
| <b>Personnel issues</b> | Illness/injury - Cabin crew            |

## Factual Information

### History of Flight

|                                |  |
|--------------------------------|--|
| <b>Landing-flare/touchdown</b> | Abnormal runway contact (Defining event) |
|--------------------------------|--|

### Pilot Information

|                                  |  |  |                |
|----------------------------------|--|--|----------------|
| <b>Certificate:</b>              | Airline transport; Flight instructor   | <b>Age:</b>                              | 55, Male       |
| <b>Airplane Rating(s):</b>       | Single-engine land; Multi-engine land  | <b>Seat Occupied:</b>                    | Left           |
| <b>Other Aircraft Rating(s):</b> | None   | <b>Restraint Used:</b>                   | 5-point        |
| <b>Instrument Rating(s):</b>     | Airplane   | <b>Second Pilot Present:</b>             |                |
| <b>Instructor Rating(s):</b>     | Airplane multi-engine; Airplane single-engine; Instrument airplane   | <b>Toxicology Performed:</b>             |                |
| <b>Medical Certification:</b>    | Class 1 With waivers/limitations   | <b>Last FAA Medical Exam:</b>            | March 29, 2022 |
| <b>Occupational Pilot:</b>       | Yes  | <b>Last Flight Review or Equivalent:</b> |                |
| <b>Flight Time:</b>              | 17500 hours (Total, all aircraft), 6000 hours (Total, this make and model), 10500 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 60 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft) |  |                |

### Co-pilot Information

|                                  |   |  |                  |
|----------------------------------|---|--|------------------|
| <b>Certificate:</b>              | Airline transport   | <b>Age:</b>                              | 49, Female       |
| <b>Airplane Rating(s):</b>       | Single-engine land; Single-engine sea   | <b>Seat Occupied:</b>                    | Right            |
| <b>Other Aircraft Rating(s):</b> | None  | <b>Restraint Used:</b>                   | 5-point          |
| <b>Instrument Rating(s):</b>     | Airplane  | <b>Second Pilot Present:</b>             |                  |
| <b>Instructor Rating(s):</b>     | Airplane multi-engine; Airplane single-engine   | <b>Toxicology Performed:</b>             |                  |
| <b>Medical Certification:</b>    | Class 1 With waivers/limitations  | <b>Last FAA Medical Exam:</b>            | January 25, 2022 |
| <b>Occupational Pilot:</b>       | Yes   | <b>Last Flight Review or Equivalent:</b> |                  |
| <b>Flight Time:</b>              | 4553 hours (Total, all aircraft), 174 hours (Total, this make and model), 1877 hours (Pilot In Command, all aircraft), 174 hours (Last 90 days, all aircraft), 66 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft) |  |                  |

### Cabin crew Information

|                                  |    |  |         |
|----------------------------------|----|--|---------|
| <b>Certificate:</b>              |    | <b>Age:</b>                              |         |
| <b>Airplane Rating(s):</b>       |    | <b>Seat Occupied:</b>                    | Unknown |
| <b>Other Aircraft Rating(s):</b> |    | <b>Restraint Used:</b>                   | 4-point |
| <b>Instrument Rating(s):</b>     |    | <b>Second Pilot Present:</b>             |         |
| <b>Instructor Rating(s):</b>     |    | <b>Toxicology Performed:</b>             |         |
| <b>Medical Certification:</b>    |    | <b>Last FAA Medical Exam:</b>            |         |
| <b>Occupational Pilot:</b>       | No | <b>Last Flight Review or Equivalent:</b> |         |
| <b>Flight Time:</b>              |    |  |         |

### Cabin crew Information

|                                  |    |  |         |
|----------------------------------|----|--|---------|
| <b>Certificate:</b>              |    | <b>Age:</b>                              |         |
| <b>Airplane Rating(s):</b>       |    | <b>Seat Occupied:</b>                    | Rear    |
| <b>Other Aircraft Rating(s):</b> |    | <b>Restraint Used:</b>                   | 4-point |
| <b>Instrument Rating(s):</b>     |    | <b>Second Pilot Present:</b>             |         |
| <b>Instructor Rating(s):</b>     |    | <b>Toxicology Performed:</b>             |         |
| <b>Medical Certification:</b>    |    | <b>Last FAA Medical Exam:</b>            |         |
| <b>Occupational Pilot:</b>       | No | <b>Last Flight Review or Equivalent:</b> |         |
| <b>Flight Time:</b>              |    |  |         |

### Cabin crew Information

|                                  |    |  |         |
|----------------------------------|----|--|---------|
| <b>Certificate:</b>              |    | <b>Age:</b>                              |         |
| <b>Airplane Rating(s):</b>       |    | <b>Seat Occupied:</b>                    | Unknown |
| <b>Other Aircraft Rating(s):</b> |    | <b>Restraint Used:</b>                   | 4-point |
| <b>Instrument Rating(s):</b>     |    | <b>Second Pilot Present:</b>             |         |
| <b>Instructor Rating(s):</b>     |    | <b>Toxicology Performed:</b>             |         |
| <b>Medical Certification:</b>    |    | <b>Last FAA Medical Exam:</b>            |         |
| <b>Occupational Pilot:</b>       | No | <b>Last Flight Review or Equivalent:</b> |         |
| <b>Flight Time:</b>              |    |  |         |

## Aircraft and Owner/Operator Information

|                                      |  |                                       |                    |
|--------------------------------------|--|---------------------------------------|--------------------|
| <b>Aircraft Make:</b>                | Boeing                                 | <b>Registration:</b>                  | N480WN             |
| <b>Model/Series:</b>                 | 737-700                                | <b>Aircraft Category:</b>             | Airplane           |
| <b>Year of Manufacture:</b>          | 2004                                   | <b>Amateur Built:</b>                 |                    |
| <b>Airworthiness Certificate:</b>    | Transport                              | <b>Serial Number:</b>                 | 33998              |
| <b>Landing Gear Type:</b>            | Retractable - Tricycle                 | <b>Seats:</b>                         | 151                |
| <b>Date/Type of Last Inspection:</b> | June 29, 2022 Continuous airworthiness | <b>Certified Max Gross Wt.:</b>       | 155000 lbs         |
| <b>Time Since Last Inspection:</b>   |  | <b>Engines:</b>                       | 2 Turbo fan        |
| <b>Airframe Total Time:</b>          | 60471 Hrs as of last inspection        | <b>Engine Manufacturer:</b>           | CFM INTL.          |
| <b>ELT:</b>                          | C126 installed, not activated          | <b>Engine Model/Series:</b>           | CFM56 SERIES       |
| <b>Registered Owner:</b>             | SOUTHWEST AIRLINES CO                  | <b>Rated Power:</b>                   | 0 Lbs thrust       |
| <b>Operator:</b>                     | SOUTHWEST AIRLINES CO                  | <b>Operating Certificate(s) Held:</b> | Flag carrier (121) |

## Meteorological Information and Flight Plan

|   |                      |   |             |
|---|----------------------|---|-------------|
| <b>Conditions at Accident Site:</b>     | Visual (VMC)         | <b>Condition of Light:</b>                  | Day         |
| <b>Observation Facility, Elevation:</b> | KSNA                 | <b>Distance from Accident Site:</b>         |             |
| <b>Observation Time:</b>                | 22:53 Local          | <b>Direction from Accident Site:</b>        |             |
| <b>Lowest Cloud Condition:</b>          | Clear                | <b>Visibility</b>                           | 10 miles    |
| <b>Lowest Ceiling:</b>                  | None                 | <b>Visibility (RVR):</b>                    |             |
| <b>Wind Speed/Gusts:</b>                | 9 knots /            | <b>Turbulence Type Forecast/Actual:</b>     | / None      |
| <b>Wind Direction:</b>                  | 210°                 | <b>Turbulence Severity Forecast/Actual:</b> | / N/A       |
| <b>Altimeter Setting:</b>               | 29.94 inches Hg      | <b>Temperature/Dew Point:</b>               | 26°C / 15°C |
| <b>Precipitation and Obscuration:</b>   |                      |   |             |
| <b>Departure Point:</b>                 | Oakland, CA (KOAK)   | <b>Type of Flight Plan Filed:</b>           | IFR         |
| <b>Destination:</b>                     | Santa Ana, CA (KSNA) | <b>Type of Clearance:</b>                   | VFR         |
| <b>Departure Time:</b>                  |                      | <b>Type of Airspace:</b>                    |             |

## Airport Information

|                             |   |                                  |                 |
|-----------------------------|---|----------------------------------|-----------------|
| <b>Airport:</b>             | John Wayne Orange County Airport<br>sna | <b>Runway Surface Type:</b>      | Asphalt         |
| <b>Airport Elevation:</b>   | 56 ft msl                               | <b>Runway Surface Condition:</b> | Dry             |
| <b>Runway Used:</b>         | 20R                                     | <b>IFR Approach:</b>             | None            |
| <b>Runway Length/Width:</b> | 5700 ft / 150 ft                        | <b>VFR Approach/Landing:</b>     | Traffic pattern |

## Wreckage and Impact Information

|                            |                     |                             |                      |
|----------------------------|---------------------|-----------------------------|----------------------|
| <b>Crew Injuries:</b>      | 1 Serious, 4 None   | <b>Aircraft Damage:</b>     | None                 |
| <b>Passenger Injuries:</b> | 137 None            | <b>Aircraft Fire:</b>       | None                 |
| <b>Ground Injuries:</b>    |                     | <b>Aircraft Explosion:</b>  | None                 |
| <b>Total Injuries:</b>     | 1 Serious, 141 None | <b>Latitude, Longitude:</b> | 33.675701,-117.86799 |

## Administrative Information

**Investigator In Charge (IIC):** Hauf, Michael

**Additional Participating Persons:**

**Original Publish Date:** August 5, 2022

**Last Revision Date:**

**Investigation Class:** [Class 4](#)

**Note:** The NTSB did not travel to the scene of this accident.

**Investigation Docket:** <https://data.ntsb.gov/Docket?ProjectID=105497>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).