# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | Sacramento, CA | **Accident Number:** | WPR15LA184 |
| **Date & Time:** | 06/11/2015, 1700 PDT | **Registration:** | N508JA |
| **Aircraft:** | ECLIPSE AVIATION CORP EA500 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Landing gear collapse | **Injuries:** | 4 None |
| **Flight Conducted Under:** | Part 135: Air Taxi & Commuter - Non-scheduled | | |

## Analysis

According to the airline transport pilot and the commercial pilot, the airplane was taxiing to the runway when they heard a loud bang and the airplane veered to the left. The pilots contacted the tower controller, who informed them that the airplane was leaking a large amount of fuel onto the tarmac. The pilots shut down the airplane and evacuated the passengers. Further examination of the airplane revealed that the left main landing gear trunnion had punctured the left wing.

Postaccident examination revealed that the left main landing gear assembly had fractured due to a fatigue crack that emanated from a sharp corner of a machined feature on the inner surface of the trunnion. The deep machining gouge mark was likely the result of an error in cleaning operation during manufacture; the cleaning tool could have extended deeper into the tapered inner surface than intended and created the deep machine gouge mark. The fatigue crack initiated on the inside of the tube and grew to a crucial size without reaching the outer wall of the tube. As a result, the crack would not have been visible during a visual inspection.

The manufacturer reported that, following the accident, they identified a systemic manufacturing defect that potentially affected the entire fleet. A mandatory service bulletin was issued to address the problem, as well as the initiation of a fleet-wide inspection and landing gear trunnion repair/replacement program.

## Probable Cause and Findings

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

A manufacturing defect that resulted in fatigue failure of the left main landing gear trunnion.

## Findings

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| **Aircraft** | Main gear strut/axle/truck - Fatigue/wear/corrosion (Cause) |
| **Organizational issues** | Manufacture/production - Manufacturer (Cause) |

## Factual Information

On June 11, 2015, at 1700 Pacific daylight time, an Eclipse Aviation Corp EA500 jet, N508JA, experienced a collapsed landing gear while taxiing to the active runway for departure at Sacramento Executive Airport (SAC), Sacramento, California. The airline transport pilot, a commercial pilot, and two passengers were not injured. The airplane was operated by Memly Aviation as a 14 *Code of Federal Regulations* Part 135 business flight. The airplane sustained substantial damage to the left wing. Visual meteorological conditions prevailed for the flight that was preparing to depart at the time of the accident, and an instrument flight rules (IFR) flight plan had been filed. The airplane was destined for San Francisco International Airport (SFO), San Francisco, California.

According to both pilots, the airplane was taxiing to the active runway when they heard a loud bang, and the airplane veered to the left. They contacted the tower asking if they had blown a tire. Tower personnel responded, and reported to the pilots that the airplane was leaking copious amounts of fuel onto the tarmac. The pilots shut down the airplane and evacuated the passengers. Upon further inspection of the airplane, the pilots reported that the left main landing gear trunnion had gone through the left wing.

According to the operator, the left main landing gear trunnion broke near the rear attachment point, which caused the landing gear to penetrate through the entire wing from bottom to top. The portion of the landing gear trunnion that failed, was housed behind a lower wing panel and would not have been visible to the flight crew.

The left main landing gear trunnion, part number M041-07H0101 serial number 0114, was original equipment and had accrued 1,275 hours and 1,492 cycles.

The left main landing gear assembly was shipped to the materials laboratory of the National Transportation Safety Board (NTSB). Visual examination revealed that the landing gear fractured at the trunnion portion of the landing gear. The smaller separated piece showed a fatigue crack that emanated from the inner wall. The crack itself was from a machining mark. The area outside of the fracture face contained rough features consistent with an overstress separation. The deep machining mark was in a portion of the trunnion where the inner wall tapered inward, and was in a transition region where the wall thickness was increasing in thickness. The assembly contained a metal squeeze-out typical of forging/casting parts. The excess metal squeezed-out of the forged/casting products are moved by machining, which renders them a high stress area.

According to the manufacturer, the initiation of the fatigue crack from a step machined inner wall of the trunnion was outside of the design requirements. Eclipse Aerospace, and the landing gear manufacturer, Mecaer Aviation Group, inspected for the presence of the machined steps. The manufacturer indicated that they had a systemic manufacturing defect that potentially effected the entire fleet of EA500 aircraft. Eclipse Aerospace and Mecaer, issued a mandatory Service Bulletin to address the issue. A fleet wide inspection/landing gear trunnion repair/replacement program identified as of May 9, 2016, that 126 airplanes had been inspected, with trunnion repaired or replaced when warranted. All owners of the EA500

airplane have been notified of the issue. The airplane and landing gear manufacturers further addressed inventory landing gear; the trunnions were reworked/repaired/replaced as warranted prior to shipment to Eclipse Aerospace. Mecaer also communicated with the machine shop responsible for the defect and process changes were put in place to prevent the issue for the existing inventory of landing gear.

## History of Flight

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| **Taxi-to runway** | Landing gear collapse (Defining event) |

## Pilot Information

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| **Certificate:** | Airline Transport | **Age:** | 54, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 5-point |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 1 With Waivers/Limitations | **Last FAA Medical Exam:** | 01/15/2015 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | 05/03/2015 |
| **Flight Time:** | (Estimated) 0 hours (Total, all aircraft), 0 hours (Total, this make and model) | | |

## Co-Pilot Information

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| **Certificate:** | Commercial | **Age:** | 25, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land | **Seat Occupied:** | Right |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 5-point |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | Yes |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 1 With Waivers/Limitations | **Last FAA Medical Exam:** | 12/02/2014 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | 12/17/2014 |
| **Flight Time:** | (Estimated) 410 hours (Total, all aircraft), 118 hours (Total, this make and model) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | ECLIPSE AVIATION CORP | **Registration:** | N508JA |
| **Model/Series:** | EA500 NO SERIES | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 2006 | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 000001 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | |
| **Date/Type of Last Inspection:** | 04/09/2015, Annual | **Certified Max Gross Wt.:** | |
| **Time Since Last Inspection:** | | **Engines:** | 2 Turbo Jet |
| **Airframe Total Time:** | 1275 Hours at time of accident | **Engine Manufacturer:** | P&W CANADA |
| **ELT:** | C126 installed, not activated | **Engine Model/Series:** | PW610F-A |
| **Registered Owner:** | JET-ALLIANCE/DAVID CROWE LLC | **Rated Power:** | 950 lbs |
| **Operator:** | Nemly Aviation | **Operating Certificate(s) Held:** | On-demand Air Taxi (135) |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual Conditions | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | SAC, 23 ft msl | **Distance from Accident Site:** | 0 Nautical Miles |
| **Observation Time:** | 1653 PDT | **Direction from Accident Site:** | 0° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 Miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 5 knots / | **Turbulence Type Forecast/Actual:** | / None |
| **Wind Direction:** | 250° | **Turbulence Severity Forecast/Actual:** | / N/A |
| **Altimeter Setting:** | 29.73 inches Hg | **Temperature/Dew Point:** | 36°C / 16°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Sacramento, CA (SAC) | **Type of Flight Plan Filed:** | IFR |
| **Destination:** | SAN FRANCISCO, CA (SFO) | **Type of Clearance:** | IFR |
| **Departure Time:** | 1700 PDT | **Type of Airspace:** | |

## Airport Information

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| **Airport:** | SACRAMENTO EXECUTIVE (SAC) | **Runway Surface Type:** | |
| **Airport Elevation:** | 23 ft | **Runway Surface Condition:** | Dry |
| **Runway Used:** | N/A | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | None |

## Wreckage and Impact Information

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| **Crew Injuries:** | 2 None | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | 2 None | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 4 None | **Latitude, Longitude:** | 35.512500, -121.493333 (est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Tealeye Cornejo | **Report Date:** | 09/11/2018 |
| **Additional Participating Persons:** | Richard T Dilbeck; Federal Aviation Administration; Sacramento, CA | | |
| **Publish Date:** | 09/11/2018 | | |
| **Note:** | The NTSB did not travel to the scene of this accident. | | |
| **Investigation Docket:** | http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=91360 | | |