

Auxiliary Power Unit Battery Fire  
Japan Airlines Boeing 787-8, JA829J  
Boston, Massachusetts  
January 7, 2013



**Incident Report**

NTSB/AIR-14/01  
PB2014-108867



**National  
Transportation  
Safety Board**

# Auxiliary Power Unit Battery Fire Japan Airlines Boeing

**United States. National Transportation  
Safety Board**



## **Auxiliary Power Unit Battery Fire Japan Airlines Boeing:**

Auxiliary Power Unit Battery Fire, Japan Airlines Boeing 787-8, JA829J, Boston, Massachusetts, January 7, 2013 United States. National Transportation Safety Board, 2014 This report discusses the January 7 2013 incident involving a Japan Airlines Boeing 787 8 JA8297 which was parked at a gate at General Edward Lawrence Logan International Airport Boston Massachusetts when maintenance personnel observed smoke coming from the lid of the auxiliary power unit battery case as well as a fire with two distinct flames at the electrical connector on the front of the case **Aircraft Incident Report** National Transportation Safety Board, 2015-03-05 On January 7 2013 about 1021 eastern standard time smoke was discovered by cleaning personnel in the aft cabin of a Japan Airlines JAL Boeing 787 8 JA829J which was parked at a gate at General Edward Lawrence Logan International Airport BOS Boston Massachusetts About the same time a maintenance manager in the cockpit observed that the auxiliary power unit APU had automatically shut down 2 Shortly afterward a mechanic opened the aft electronic equipment bay E E bay and found heavy smoke coming from the lid of the APU battery case and a fire with two distinct flames at the electrical connector on the front of the case 3 None of the 183 passengers and 11 crewmembers were aboard the airplane at the time and none of the maintenance or cleaning personnel aboard the airplane was injured Aircraft rescue and firefighting ARFF personnel responded and one firefighter received minor injuries The airplane had arrived from Narita International Airport NRT Narita Japan as a regularly scheduled passenger flight operated as JAL flight 008 and conducted under the provisions of 14 Code of Federal Regulations CFR Part 129 The captain of JAL flight 008 reported that the APU was turned on about 30 to 40 min before the airplane left the gate at NRT about 0247Z and was shut down after the engines started 4 He stated that the flight which departed NRT about 0304Z was uneventful except for occasional moderate turbulence about 6 5 to 7 hours into the flight Flight data recorder FDR data showed that the airplane touched down at BOS at 1000 24 and that the APU was started at 1004 10 while the airplane was taxied to the gate The captain indicated that the APU operated normally FDR data also showed that the airplane was parked at the gate with the parking brake set and both engines shut down by 1006 54 The maintenance manager the JAL director of aircraft maintenance and engineering at BOS reported that the passengers had deplaned by 1015 and that the flight and cabin crewmembers had deplaned by 1020 at which time he and the cabin cleaning crew had entered the airplane Shortly afterward a member of the cleaning crew told the maintenance manager who was in the cockpit about an electrical burning smell and smoke in the aft cabin The maintenance manager then observed a loss of power to systems powered by the APU and realized that the APU had automatically shut down After confirming that the airplane s electrical power systems were off the maintenance manager turned the main and APU battery switches to the off position FDR data showed that the APU battery failed at 1021 15 and that the APU shut down at 1021 37 which was also when the APU controller lost power A JAL mechanic in the aft cabin at the time reported that when the airplane lost power he went to the cockpit and learned that the

APU had shut down The mechanic then went back to the aft cabin and saw and smelled smoke A JAL station manager arrived at the airplane and reported that when he went into the cabin through the door where the passenger boarding bridge is attached he saw intense smoke that was concentrated 10 ft aft of the door The turnaround coordinator for JAL flights 008 and 007 5 who had also entered the aft cabin and observed the smoke described the smoke as caustic smelling The mechanic notified the maintenance manager about the smoke and the maintenance manager asked the mechanic to check the aft E E bay The mechanic found heavy smoke and flames in the compartment coming from the lid of the APU battery case The mechanic reported that he used a dry chemical fire extinguisher located at the base of the passenger boarding bridge to attempt to put out the fire but that the smoke and flames did not stop

**Large Scale Energy Storage 10 -and- Battery Safety and Failure Modes** B. Liaw,2019-05-17 This issue of ECS Transactions includes papers based on presentations from the symposia Large Scale Energy Storage 10 and Battery Safety and Failure Modes originally held at the 235th ECS Meeting in Dallas Texas May 26 30 2019 [Lithium-Ion Batteries and Applications: A Practical and Comprehensive Guide to Lithium-Ion Batteries and Arrays, from Toys to Towns, Volume 2, Applications](#) Davide Andrea,2020-06-30 This comprehensive two volume resource provides a thorough introduction to lithium ion Li ion technology Readers get a hands on understanding of Li ion technology are guided through the design and assembly of a battery through deployment configuration and testing The book covers dozens of applications with solutions for each application provided Volume Two focuses on small batteries in consumer products and power banks as well as large low voltage batteries in stationary or mobile house power telecom residential marine and microgrid Traction batteries including passenger industrial race vehicles public transit marine submarine and aircraft are also discussed High voltage stationary batteries grid tied and off grid are presented exploring their use in grid quality arbitrage and back up residential microgrid industrial office buildings Finally the book explores what happens when accidents occur so readers may avoid these mistakes Written by a prominent expert in the field and packed with over 500 illustrations these volumes contain solutions to practical problems making it useful for both the novice and experienced practitioners *Departments of Transportation, and Housing and Urban Development, and Related Agencies Appropriations for 2017* United States. Congress. House. Committee on Appropriations. Subcommittee on Transportation, Housing and Urban Development, and Related Agencies,2016 [Electric Flight Technology](#) Ravi Rajamani,2018-05-28 The environmental impact of hydrocarbon burning aircraft is one of the main motivations for the move to electric propulsion in aerospace Also cars buses and trucks are incorporating electric or hybrid electric propulsion systems reducing the pressure on hydrocarbons and lowering the costs of electrical components The economies of scale necessitated by the automotive industry will help contain costs in the aviation sector as well The use of electric propulsion in airplanes is not a new phenomenon However it is only recently that it has taken off in a concrete manner with a viable commercial future The *Electric Flight Technology Unfolding of a New Future* reviews the history of this field discusses the key underlying

technologies and describes how the future for these technologies will likely unfold distinguishing between all electric AE and hybrid electric HE architectures Written by Dr Ravi Rajamani it covers the essential information needed to understand this new technology wave taking hold in the aerospace industry The Electric Flight Technology Unfolding of a New Future covers fundamental topics such as The history of electric propulsion including its evolution from using traditional electricity to solar power to batteries as sources to sustain propulsion and flight The various architectures being considered for electric aircraft specifically small general aviation GA aircraft and larger business jets single aisle commercial aircraft and larger twin aisle commercial aircraft The various systems and subsystems of an electric aircraft along with how various subsystems in the vehicle can be integrated in a more optimal manner In the future the existing tube and wing configuration will not be the only available architecture instead we will be more likely to find an architecture where the propulsion system is embedded within the airframe The future trends in this arena and what we can expect to see in the next decade or so [Departments of Transportation, and Housing and Urban Development, and Related Agencies Appropriations for 2016](#) United States.

Congress. House. Committee on Appropriations. Subcommittee on Transportation, Housing and Urban Development, and Related Agencies,2015 **Future Lithium-ion Batteries** Ali Eftekhari,2019-03-14 Lithium ion batteries are an established technology with recent large scale batteries finding emerging markets for electric vehicles and household energy storage Battery research during the past two decades has focussed on practical improvements to available batteries such as cell design to enhance energy density which are currently nearing their maximum potential We must now consider alternative avenues of research in pursuit of a new breakthrough in this technology This book collects authoritative perspectives from leading researchers to project the emerging opportunities in the field of lithium ion batteries Covering topics including anode and cathode materials electrolytes emerging markets and the challenges and opportunities of lithium ion battery supply it will provide researchers with cutting edge leads to advance the next generation of materials Edited by a pioneer in the field and with contributions from experts from across the globe this book will be of use to graduate students and researchers in academia and industry interested in lithium ion batteries and energy storage [2014 Final NTSB Aircraft Incident Report on Boeing 787 Dreamliner Airplane Yuasa Lithium Battery Fire Japan Airlines JA829J - Covering Tests, Analysis, Conclusions and Recommendations](#) National Transportation Safety Board (NTSB),U. S. Government,2018-03-02 This book provides the complete National Transportation Safety Board NTSB Aircraft Incident Report issued in November 2014 plus a full compilation of documents and additional information about the fires and smoke incidents involving lithium ion batteries on Boeing 787 Dreamliner commercial airplanes in 2013 This report discusses the January 7 2013 incident involving a Japan Airlines Boeing 787 8 JA8297 which was parked at a gate at General Edward Lawrence Logan International Airport Boston Massachusetts when maintenance personnel observed smoke coming from the lid of the auxiliary power unit battery case as well as a fire with two distinct flames at the electrical connector on the front of the case No passengers or crewmembers

were aboard the airplane at the time and none of the maintenance or cleaning personnel aboard the airplane was injured Safety issues relate to cell internal short circuiting and the potential for thermal runaway of one or more battery cells fire explosion and flammable electrolyte release cell manufacturing defects and oversight of cell manufacturing processes thermal management of large format lithium ion batteries insufficient guidance for manufacturers to use in determining and justifying key assumptions in safety assessments insufficient guidance for Federal Aviation Administration FAA certification engineers to use during the type certification process to ensure compliance with applicable requirements and stale flight data and poor quality audio recording of the 787 enhanced airborne flight recorder Safety recommendations are addressed to the FAA The Boeing Company and GS Yuasa Corporation Executive Summary 1 Factual Information 1 1 Event History 1 2 Airplane Information 1 2 1 Battery Information 1 2 2 Battery and Related Component Information 1 2 3 Postincident Airplane Examination 1 2 4 Additional Airplane Related Information 1 3 Flight Recorders 1 4 Incident Battery Examinations 1 4 1 External Observations 1 4 2 Radiographic Examinations of Incident Battery and Cells 1 4 3 Disassembly of Incident Battery 1 4 4 Battery Case Protrusion and Corresponding Cell Case Damage 1 4 5 Disassembly of Incident Battery Cells 1 5 Exemplar Battery Examinations and Testing 1 5 1 Radiographic Examinations of Exemplar Battery Cells 1 5 2 Cell Soft Short Tests 1 5 3 Examinations of Cells From the Incident Airplane Main Battery 1 5 4 Cell Level Abuse Tests 1 5 5 Rivet Observations During Cell and Battery Level Testing 1 5 6 Cold Temperature Cell and Battery Level Testing 1 5 7 Battery Level Nail Penetration Tests 1 5 8 Additional Testing 1 6 Battery Manufacturing Information 1 6 1 Main and Auxiliary Power Unit Battery Development 1 6 2 Cell Manufacturing Process 1 7 System Safety and Certification 1 7 1 Type Certification Overview and Battery Special Conditions 1 7 2 Certification Plan 1 7 3 System Safety Assessment 1 8 Additional Information 1 8 1 Federal Aviation Administration Actions After Battery Incidents 1 8 2 Previously Issued Safety Recommendations 2 Analysis 2 1 Failure Sequence 2 2 Emergency Response 2 3 Cell Manufacturing Concerns 2 4 Thermal Management of Large Format Lithium Ion Batteries 2 4 1 Battery Internal Heating During High Current Discharge 2 4 2 Cell Level Temperature and Voltage Monitoring 2 4 3 Thermal Safety Limits for Cells 2 5 Certification Process 2 5 1 Validation of Assumptions and Data Used in Safety Assessments Involving New Technology 2 5 2 Validating Methods of Compliance for Designs Involving New Technology 2 5 3 Certification of Lithium ion Batteries and Certification of New Technology 2 6 Flight Recorder Issues 2 6 1 Stale Flight Data 2 6 2 Poor Quality Cockpit Voice Recording 3 Conclusions 3 1 Findings 3 2 Probable Cause 4 Recommendations 4 1 New Recommendations 4 2 Previously Issued Safety Recommendations Classified in This Report

*Linden's Handbook of Batteries, Fifth Edition* Kirby W. Beard, 2019-05-10 Publisher's Note Products purchased from Third Party sellers are not guaranteed by the publisher for quality authenticity or access to any online entitlements included with the product Thoroughly revised comprehensive coverage of battery technology characteristics and applications This fully updated guide offers complete coverage of batteries and battery usage from classic designs to emerging technologies

Compiled by a pioneer in secondary lithium batteries the book contains all the information needed to solve engineering problems and make proper battery selections You will get in depth descriptions of the principles properties and performance specifications of every major battery type Linden s Handbook of Batteries Fifth Edition contains cutting edge data and equations design specifications and troubleshooting techniques from international experts New chapters discuss renewable energy systems battery failure analysis lithium ion battery technology materials and component design Recent advances in smartphones and hybrid car batteries are clearly explained including maximizing re chargeability reducing cost improving safety and lessening environmental impact Coverage includes Electricity electrochemistry and batteries Raw materials Battery components Principles of electrochemical cell operations Battery product overview Electrochemical cell designs platform technologies Primary batteries Secondary batteries Miscellaneous and specialty batteries Battery applications Battery industry infrastructure

**2013 Boeing 787 Dreamliner Airplane Lithium Battery Fire NTSB Investigation - Event History, Battery and Component Examinations and Testing, Flight Recorders, Status Reports** National Transportation Safety Board (NTSB), U. S. Government, 2017-04-16 This book provides a compilation of documents and information from the National Transportation Safety Board NTSB about the ongoing investigation into fires and smoke incidents involving lithium ion batteries on Boeing 787 Dreamliner commercial airplanes in 2013 It includes the March interim factual report which summarizes the NTSB s initial findings on the JAL battery fire investigation The report includes details on how the maintenance personnel discovered the fire and how the firefighters responded and extinguished it findings from the examination of the battery and test results of related components initial reports on the flight recorder data a description of the 787 electrical power system certification plan and a list of ongoing and planned investigative activities Contents of that report include Abbreviations and Acronyms Executive Summary 1 Factual Information 1 1 Event History 1 2 Airplane Information 1 3 Battery Information 1 4 Flight Recorders 1 5 Battery Examinations 1 5 1 External Observations 1 5 2 Battery Disassembly 1 5 3 Battery Case Protrusion and Corresponding Cell Case Damage 1 5 4 Radiographic Examinations 1 6 Component Testing 1 6 1 Battery Charger Unit 1 6 2 Start Power Unit 1 6 3 Battery Monitoring Unit 1 6 4 Contactor 1 6 5 Auxiliary Power Unit Controller 1 7 System Safety and Certification 1 7 1 Type Certification and Battery Special Conditions 1 7 2 Certification Plan 1 7 3 System Safety Assessment 1 8 Federal Aviation Administration Actions After Battery Incidents 1 9 Additional Information 2 Ongoing and Planned Investigation Activities Appendix Boeing 787 Type Certification Special Conditions 25 359 SC On January 7 2013 about 1021 eastern standard time smoke was discovered by cleaning personnel in the aft cabin of a Japan Airlines JAL Boeing 787 8 JA829J which was parked at a gate at General Edward Lawrence Logan International Airport BOS Boston Massachusetts About the same time a maintenance manager in the cockpit observed that the auxiliary power unit APU the sole source of airplane power at the time had automatically shut down Shortly afterward a mechanic opened the aft electronic equipment E E bay and found heavy smoke and fire coming from the front of the APU

battery case 2 No passengers or crewmembers were aboard the airplane at the time and none of the maintenance or cleaning personnel aboard the airplane was injured Aircraft rescue and firefighting personnel responded and one firefighter received minor injuries The airplane had arrived from Narita International Airport Narita Japan as a regularly scheduled passenger flight operated as JAL flight 008 The APU battery provides power to start an APU during ground and flight operations Flight data recorder FDR data showed that the APU was started about 1004 while the airplane was being taxied to the gate after arrival at BOS The FDR data also showed that about 36 seconds before the APU shut down at 1021 37 the voltage of the APU battery began fluctuating dropping from a full charge of 32 volts to 28 volts about 7 seconds before the shutdown The APU battery consists of eight lithium ion cells that are connected in series and assembled in two rows of four cells Each battery cell has a nominal voltage of 3.7 volts The cells have a lithium cobalt oxide compound chemistry and contain a flammable electrolyte liquid

*Flight International* ,2013      **International Aerospace Abstracts** ,1991      **Jane's All the World's Aircraft** ,1989

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