



**National
Transportation
Safety Board**

Investigative Update of Battery Fire Japan Airlines B-787 - Jan 7, 2013

Deborah A.P. Hersman

Chairman

January 24, 2013



Timeline – JAL Battery Incident

- 10:06am - aircraft arrived at gate in Boston from Narita, Japan
 - 183 passengers and 11 crew deplaned
- 10:32am - Cleaning and maintenance crew noticed smoke in cabin
- 10:35am - Mechanic noted flames coming from APU battery in aft electronics bay

Timeline, cont.

- 10:37am – Airport Rescue & Fire Fighting notified
- 10:40am – Fire and rescue personnel arrive on scene
- 12:19pm – Fire and rescue personnel report event was “controlled”

APU Battery

Exemplar Battery

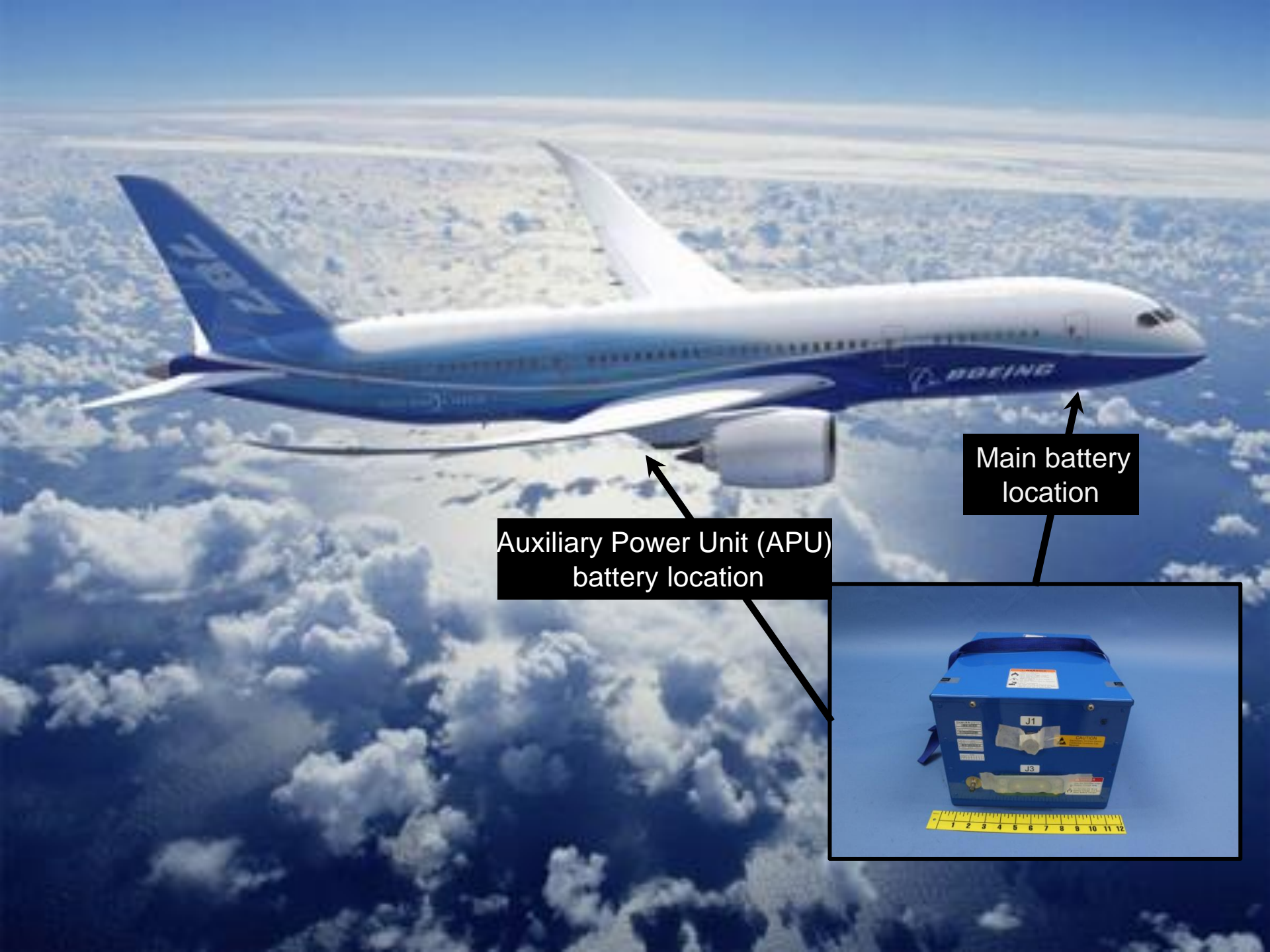


JAL Event Battery



Damage to Aft Electronics Bay





Auxiliary Power Unit (APU)
battery location

Main battery
location



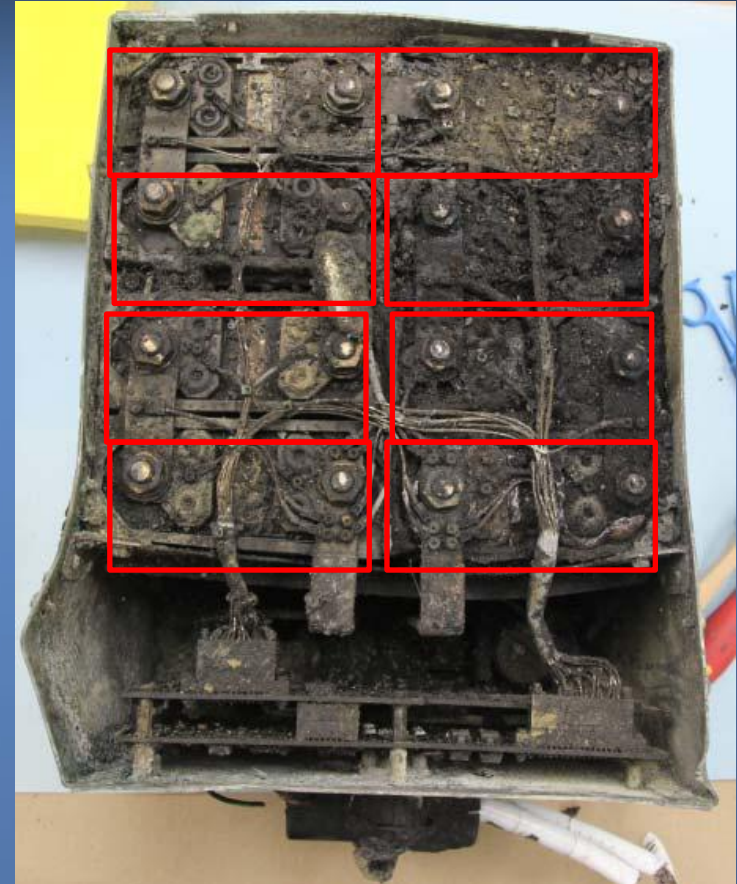
Investigative Activities

- Battery exam and teardown at NTSB Materials Laboratory
- Component exam and teardown
 - Tucson, AZ – Battery Charger Unit and Start Power Unit (Securaplane Technologies)
 - Phoenix, AZ – APU Controller (United Technology Aerospace Systems)
 - Seattle, WA – Two General Purpose Modules (Boeing Commercial Airplanes)
 - Fujisawa, Japan – Battery Monitoring Unit (Kanto Aircraft Instrument)

JAL APU Battery Cells



Exemplar Battery

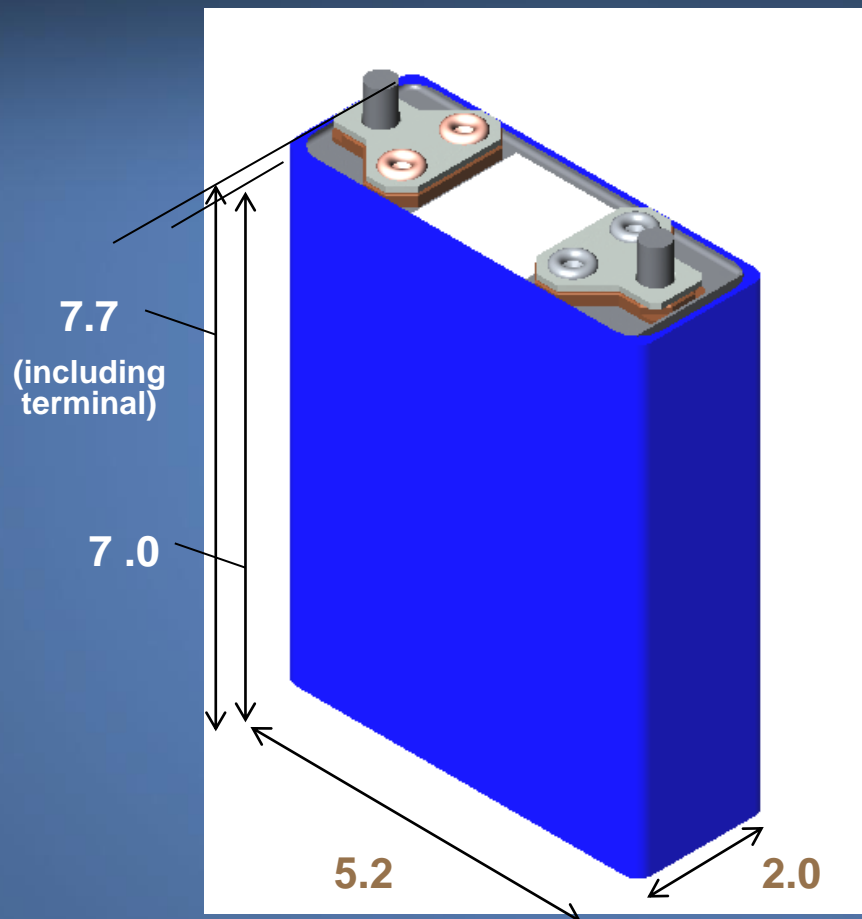


JAL Event Battery

Cell and Battery Specifications

		Cell	Battery
Nominal capacity (Ah)		75	75
Nominal voltage		3.7	29.6
Operational voltage range (V)		2.5 – 4.025	20 – 32.2
Weight (lb.)		6.0	63
Dimensions (in.)			
	W	5.2	10.9
	D	2.0	14.2
	H	7.7	8.5

Cell Design

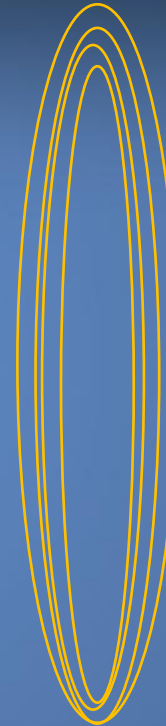
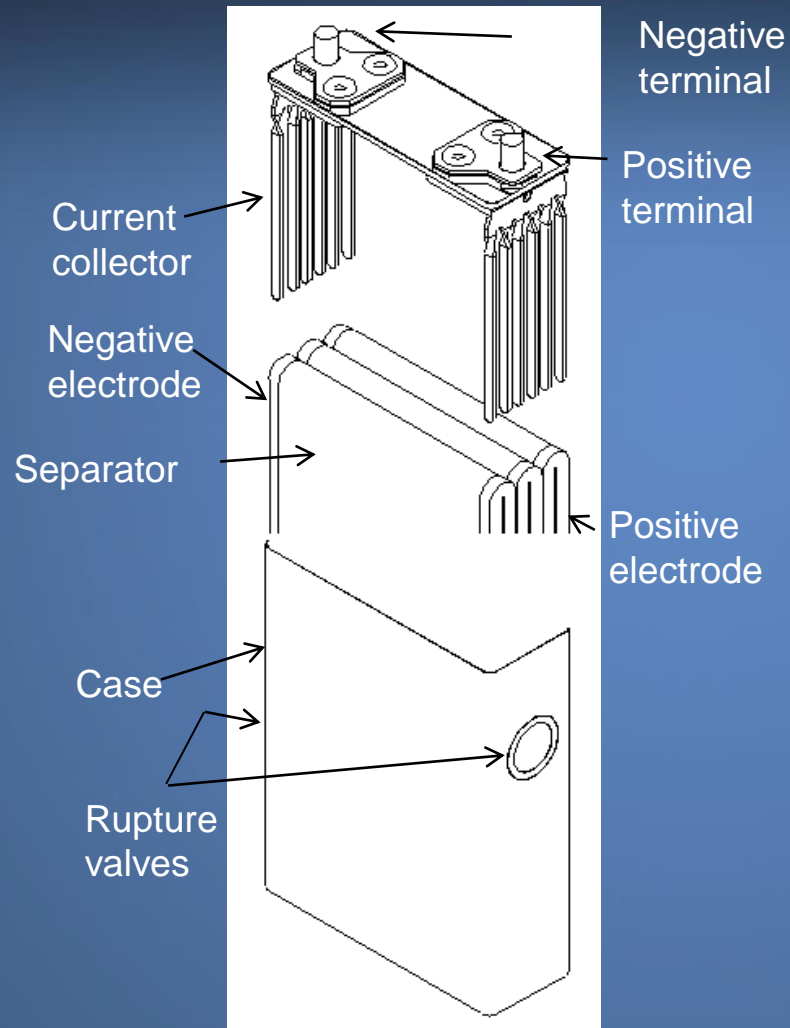


(Unit : inch)



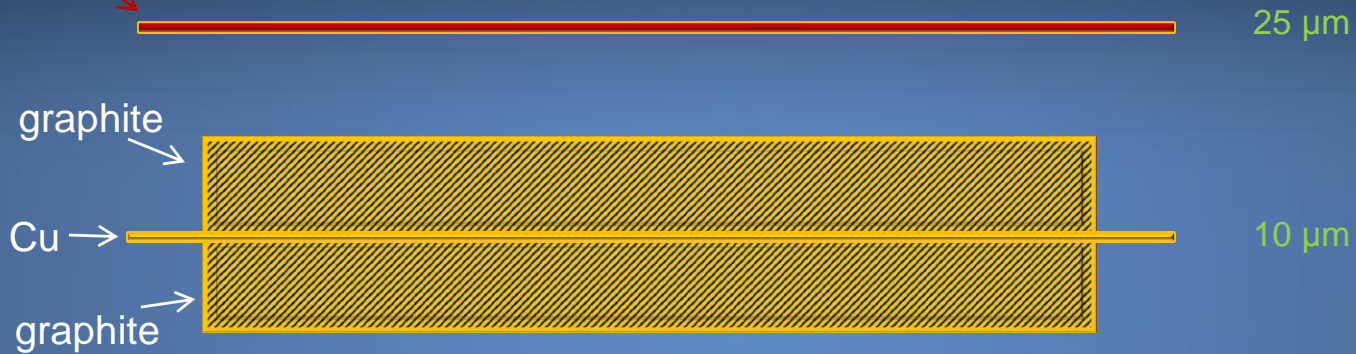
NTSB

Electrodes

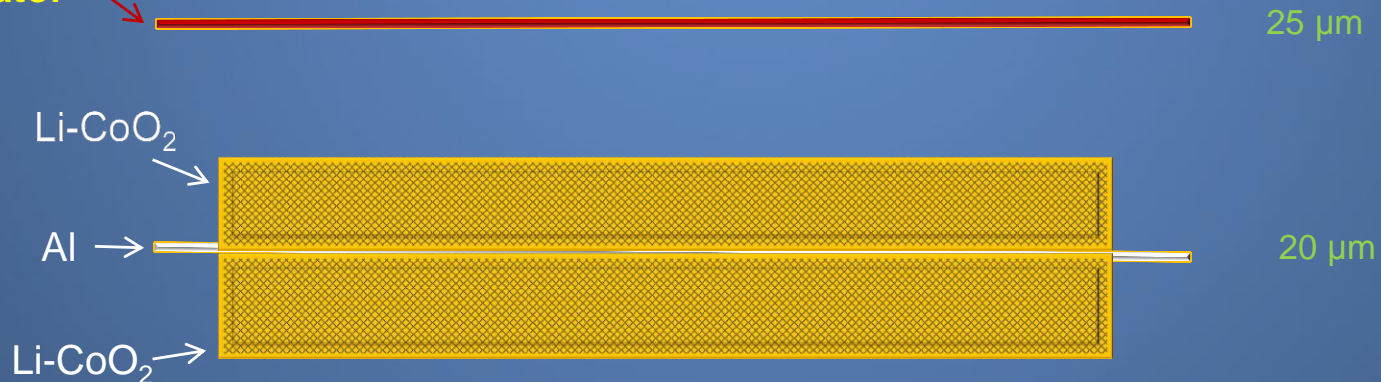


Electrode Construction

separator



separator



Not to scale

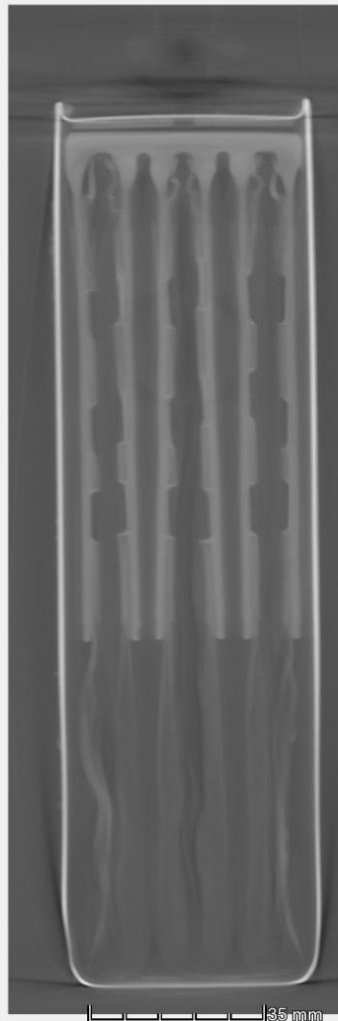
Example of a Cell CT Scan

DCA13IA037 - JAL 787 - Boston

Volume 1 grid coordinate system

9.14 mm \pm 0.50 mm

Right 1



83%

NTSB Lab Activities



Cell Examinations To Date

SEM –
Scanning Electron
Microscopy

EDS –
Energy Dispersive
Spectroscopy

• CT scan of entire assembly		
8	• disassembled	• CT scan 1
7	• CT scan • disassembled • SEM	• disassembled 2
6	• CT scan • disassembled	• CT scan 3
5	• CT scan • disassembled • SEM • EDS	• CT scan 4

We Are Looking For:

- Signs of thermal runaway
- Signs of electrical short circuiting
- Manufacturing defects
- “Anything unusual”

Damaged Electrode - Internal Short Circuit



Cell 6 CT Scan

DCA131A037 - JAL 787 - Boston
Volume 1 grid coordinate system
10.53 mm

Right 1



137%



NTSB

CT Scan of Battery



NTSB

Findings To Date

- Fire was present
- Signs of thermal runaway
- Signs of electrical short circuiting

Next Steps

- Complete the in-house laboratory examinations
- Conduct examinations and testing of exemplar batteries
- Synthesize lab examination findings with fire forensics and aviation systems investigation

Parties to Investigation

- Federal Aviation Administration
- Boeing Commercial Airplanes
- Accredited Representatives
 - Japan – JTSB
 - GS Yuasa
 - Japan Airlines
 - France – BEA
 - Thales Avionics Electrical Systems
- Technical assistance provided by Carderock Division, Naval Surface Warfare Center

JTSB Investigation ANA Battery Event



Photo by Reuters/Kyodo/Landov



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