EXHIBIT 2

Comments on Boeing Briefing April 17, 2013

David Zuckerbrod, PhD, CFEI

I have been asked by Paul Hudson of FlyersRights.org to review and comment on the fix proposed by Boeing for its 787 Dreamliner to prevent future fires and/or battery failures of the type that caused the FAA to order grounding of all such aircraft by US air carriers and which order has generally been followed by other aviation safety agencies around the world. I have a PhD in inorganic chemistry from Rensselaer Polytechnic Institute and have worked as a scientist in the field of battery safety since 1981. I am also a Certified Fire and Explosion Investigator. I have no business relations with the Boeing Corporation or the manufacturer of its 787 batteries. My full resume detailing my qualifications as a battery safety expert is enclosed herewith as Attachment 1. A copy of the public briefing by Boeing of its battery fix is enclosed herewith as Attachment 2.

Background of Safety Testing for Lithium Ion Batteries

Safety testing of batteries has been a challenge for the industry for many years. In lithium ion fires, the root cause of the fire is generally obliterated by the fire. The fire is usually very hot and all the organic components of the cells are either ejected, pyrolyzed or burned. Breaching the separator is the most likely contributor to thermal runaway. The separator, usually polypropylene, begins to soften and shrink above 130°C (266°F). Ceramic coated separators are perhaps more thermally stable. But if the separator melts or shrinks, large areas of the electrodes come into contact allowing the free transfer of electrons known as a short circuit. This, in turn, rapidly converts all the energy stored in the cell into heat. The electrolyte boils, pressure in the cells rise and venting can occur.

Simulating this in a test that approximates reality has been a real challenge. Typical safety tests include nail puncture, overcharge, overdischarge, crushing, overheating, and short circuit either at room temperature or at elevated temperature. The problem is that none of these address a failure due to a localized internal short. A large particle punctures the separator or the separator develops a pinhole. Localized heating occurs, fed by current from the healthy part of the cell. When the local temperature exceeds the capabilities of the separator, then cell venting or explosion can follow, setting off a cascade of cell failures and venting. This failure mode has been problematic. It occurs rarely and randomly. It is more common in the series/parallel arrays of cells used for laptop computers.

Problems with the Boeing 787 Proposed Battery Fix

The Boeing briefing was short on testing details. The traditional safety testing will catch basic flaws in the battery design but it is difficult to generate a failure mode identical to what actually happens in a failing cell. The industry is developing standards for testing lithium-ion batteries for aircraft, this is a work in progress. The test matrix presently under consideration will require about a year of test time.

Lithium ion cells are produced by the billions. The failure rate is in the thousands. By any measure of quality, the battery industry must run a high quality operation to enjoy widespread use of its product while staying out of the evening news.

I take issue with some statements contained in the Boeing briefing. I am concerned that they claim that the enclosure prevents fire by self-inerting. Battery fires can certainly occur in the absence of oxygen. The only thing that the enclosure prevents is the free burning of solvents ejected from the venting cells.

You can probably remember the fire triangle from school. In battery parlance, "Fuel" is replaced by the negative electrode and the electrolyte, "Oxygen" is replaced by the positive electrode, a powerful oxidizing agent. In practice, the negative electrode, a powerful reducing agent, sits only a thousandths of

an inch away from the positive electrode. They are separated only 25 microns of very porous plastic membrane. Heat is still a factor however. As the temperature rises in a cell, unwanted reactions occur which cause the cell to self-heat faster and faster until thermal runaway occurs. A sudden short circuit in the hot cell can provide intense local heating, sufficient to destroy the separator and cause venting and fire. Inerting the enclosure does not prevent the positive electrode from reacting with the negative electrode and generating a lot of heat and likely a hot fire. Only the flammable electrolyte ejected from the cell will be spared from combustion if the enclosure self-inerts. Combustion products of a fire limited by lack of oxygen are very toxic and I am pleased that the combustion products are vented overboard.

I am also concerned about the thermal design of the battery. I understand that it is very important to isolate cells to prevent cascading cell failures. However, the insulation also slows the cooling of the cells to allow heat generated in normal use. The lithium-cobalt oxide cell chemistry begins to self-heat above 90°C (194°F) in a well insulated situation. Large format lithium-cobalt oxide batteries generally require active cooling when used in charge-discharge cycling, for instance in an electric vehicle. The battery in the 787 has a less strenuous duty cycle than in an electric vehicle. The insulation will require the battery's power capability and duty cycle rating to be reduced.

Date: May 7, 2013

David Zuckerbrod, Ph.D.

Attachment 1

David Zuckerbrod, Ph.D.

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Profile Experienced Scientist, current IC Secret Clearance, with broad knowledge of electrochemistry, especially of energy related devices such as batteries, capacitors and fuel cells; working knowledge of laboratory instrumentation and electronics particularly as related to battery, fuel cell and capacitor testing; seeking suitable role as a Research Scientist, Engineer, Consultant, Expert Witness or Project Manager in electrochemical energy storage or electrochemical devices.

Professional Experience

Electrochemical Solutions, LLC. Baltimore, MD 2012 to present
Owner

- Consultant for developers of electrochemical devices
- Developing high-rate alkaline cells for commercialization
- Assisting in the development of corrosion resistant connectors for medical implants
- Consulting for the developers of an electrolysis cell for use in a medical implant

BAE Systems Inc. Rockville, MD 2008 to 2012
Principal Scientist

- Managed Analytical Chemistry Group charged with analyzing battery failures and anomalous behaviors. This included a full suite of chemical analyses, electrochemical testing and CT imaging.
- Provided subject matter expertise on batteries and electrochemical measurements
- Served as final reviewer of test reports issued to customers
- Devised innovative solutions to customer problems
- Maintained role of Chairman of safety committee

W. L. Gore & Associates Elkton, MD 1994 to 2008
Electrochemical Technologist

- Provided technical leadership to W. L. Gore's Battery and Capacitor Team for fourteen years
- Interfaced with customers to solve customer issues
- Helped solve production and scale-up issues on the path to commercialization
- Provided technical direction for R&D efforts from the product concept throughout product development
- Designed and tested electrodes for lithium ion and lithium primary batteries including test vehicle development and statistical design of experiments
- Tested and provided technical support for electrodes for electrochemical double layer capacitors, including diagnosis and resolution of customer issues
- Invented novel gas diffusion membranes and air cathodes for zinc-air batteries to eliminate expensive materials and improve performance of hearing aid batteries
- Commercialized low resistance PTFE separators for batteries and capacitors. This material significantly increased the energy density of lithium primary cells and enabled the commercialization of a new class of supercapacitors.
- Developed and tested membranes and electrodes for PEM fuel cells. This type of membrane is used in many of the fuel cell vehicles on the road today.
- Developed quality assurance tests for carbon monoxide sensor membrane-electrode assemblies.

W. R. Grace & Co. 1988 to 1994

Senior Research Chemist

- Served as Principal Investigator on U. S. Advanced Battery Consortium (USABC) lithium-polymer electric vehicle battery program at Washington Research Center. This was a $27 million program.
    - Prepared the proposal
    - Interfaced with subcontractors and sponsors
    - Prepared reports
    - Set up test facilities
    - Helped design and set up a pilot production facility including the largest controlled atmosphere glove box in the world
    - Provided technical direction to a large and diverse project
- Developed and tested novel alkaline battery separator for aircraft batteries
- Developed and tested novel shut-down separator for lithium cells. IP was generated which was the basis for separators in all lithium ion cells today.
- Developed and tested rechargeable lithium batteries aimed at the cellular phone market

Westinghouse Electric Corp. 1981 to 1988

Senior Engineer A

- Served as Principal Investigator on DOE Iron-Air Battery Program at Research Development Center, a $5 million program
    - Prepared the proposal
    - Designed the electrodes and cell
    - Tested the cells and prepared reports
    - Designed and built a computer controlled battery cycler
- Tested silver-iron batteries for a military application
- Diagnosed and devised solution to problems in nickel-iron EV cells
- Invented novel magnesium-sea water batteries for a sea-floor application
- Built test stands and tested solid oxide steam electrolysis cells for hydrogen production
- Built test stands and tested solid oxide fuel cells and phosphoric acid fuel cells for use in large scale power generation

Education

Ph.D., Inorganic Chemistry, Rensselaer Polytechnic Institute
B.S., Chemistry, Rensselaer Polytechnic Institute

Other Credentials

Project Management Professional (PMP) from the Project Management Institute (3/2011)
Certified Fire and Explosion Investigator (CFEI) from the National Association of Fire Investigators (8/2012)

Memberships

- American Chemical Society
- National Association of Fire Investigators

1/31/2013

"The Electrochemistry of Tungsten (V), Tungsten (IV) and Tungsten (III) in Molten LiCl-KCl Eutectic", *J. Electrochem Soc.,* **130** (3), C130, (1983).

"Carbon Corrosion",*J. Electrochem Soc.,* **130** (3), C75, (1983).

"Storage Battery Aspects of Air Electrode Research", *Proc. Intersoc. Energy Convers. Eng. Conf.,* **18** (4), 1703-7, (1983).

"The Electrochemistry of Tungsten and Tungstate in Molten Lithium Chloride-Potassium Chloride Eutectic", *Diss. Abstr. Int. B.,* **43** (5), 1489 (1982)

Patents

US 6,921,606 (April 16, 2002) "Composite Films for Electrochemical Devices"

US 5,580,654 (Dec. 3, 1996) "Insulated Electrical Conductor"

US 5,547,551 (Aug. 20, 1996) "Ultra-Thin Integral Composite Membrane"

US 5,336,573 (Aug. 9, 1994) "Battery Separator"

US 5,143,805 (Sept. 1, 1992) "Polymer Bonded Battery Cathodes"

US 4,923,579 (May 8, 1990) "Electrochemical Process for Zirconium Alloy Recycling"

US 4,822,698 (Apr. 18, 1989) "Seawater Battery"

US 4,888,256 (Dec. 19, 1989) "Separator"

US 4,448,856 (May 15, 1984) "Battery and Fuel Cell Electrodes Containing Stainless Steel Charging Additive"

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Publications and Patents

19 publications, 9 patents issued.

Publications

Status of Electrode Technology for Ultracapacitors", Advanced Automotive Batteries Conference (2007)

"In-situ Detection of Hydrogen Peroxide in PEM Fuel Cells", *J. Electrochem. Soc.***152**, A1165 (2005).

"How Dry I Am: Optimizing Cell Performance Through Proper Drying" 15th International Seminar on Double Layer Capacitors and Hybrid Energy Storage Devices (2005)

"Lower Cost EDLC Electrodes, Where We Are Today", Advanced Capacitor World Summit (2005)

"Performance of Carbon-PTFE Composite Electrodes and PTFE Separators in Electrochemical Double Layer Capacitors", 9th International Seminar of Electrochemical Double Layer Capacitors and Similar Energy Storage Devices (1999).

"Mathematical Modeling of Grace Lithium-Titanium Disulfide Cells", *Proc. - Electrochem. Soc.,* **91-10**, 88-95, (1991).

"Mathematical Modeling of Grace Li-TiS_2 Cells", *Ext. Abs., Meeting - Int. Soc. of Electrochem.*, **91-2**, 87-8, (1991).

"Life, Performance and Safety of Grace Rechargeable Lithium-Titanium Disulfide Cells", *Proc. Int. Power Sources Symp.,* **34**, pp 172-5, (1990).

"Program to Analyze the Failure Mode of Lead-Acid Batteries", Sandia National Labs. (1986).

"Hydrogen Production Employing High-Temperature Solid Oxide Cells", *Proc. Intersoc. Energy Convers. Eng. Conf.,* **19**, (3), 1415-20, (1984).

"Carbon Electrochemistry in Alkaline Systems", *Proc. Electrochem. Soc.,* **84-5**, 238-50, (1984).

"Prototype-Size Iron-Air Cell Performance", *J. Electrochem. Soc.,* **132** (8), C337, (1985).

"Iron-Air Cell Drive Cycle Performance", *J. Electrochem. Soc.,* **132** (8), C337, (1985).

"The Electrochemistry of Tungsten (V), -(IV) and -(III) in Molten Lithium Chloride-Potassium Chloride Eutectic", *Proc. - Electrochem Soc.,* **84-2**, 571-84, (1984).

"Automation of Electrochemical Perturbation-Relaxation Techniques", *J. Electrochem Soc.,* **130** (3), C339, (1983).

Attachment 2

Enhanced Production Controls and Operating Processes

The first layer of improvements is taking place during the manufacture of the batteries in Japan. Boeing teamed with Thales, the provider of the integrated power conversion system, and battery maker GS Yuasa to develop and institute enhanced production standards and tests to further reduce any possibility for variation in the production of the individual cells as well as the overall battery.

"We've all developed a better understanding of the sensitivities of this technology to variations during the manufacturing process," said Sinnett. "And we all feel the need to increase monitoring of this process on an ongoing basis."

Four new or revised tests have been added to screen cell production, which now includes 10 distinct tests. Each cell will go through more rigorous testing in the month following its manufacture including a 14-day test during which readings of discharge rates are being taken every hour. This new procedure started in early February and the first cells through the process are already complete. There are more than a dozen production acceptance tests that must be completed for each battery.

Boeing, Thales and GS Yuasa have also decided to narrow the acceptable level of charge for the battery, both by lowering the highest charge allowed and raising the lower level allowed for discharge. Two pieces of equipment in the battery system – the battery monitoring unit and the charger are being redesigned to the narrower definition. The battery charger will also be adapted to soften the charging cycle to put less stress on the battery during charging.

Improved Battery Design Features

Changes inside the battery will help to reduce the chances of a battery fault developing and help to further isolate any fault that does occur so that it won't cause issues with other parts of the battery.

To better insulate each of the cells in the battery from one another and from the battery box, two kinds of insulation will be added. An electrical insulator is being wrapped around each battery cell to electrically isolate cells from each other and from the battery case, even in the event of a failure. Electrical and thermal insulation installed above, below and between the cells will help keep the heat of the cells from impacting each other.

Wire sleeving and the wiring inside the battery will be upgraded to be more resistant to heat and chafing and new fasteners will attach the metallic bars that connect the eight cells of the battery. These fasteners include a locking mechanism.

Finally, a set of changes is being made to the battery case that contains the battery cells and the battery management unit. Small holes at the bottom will allow moisture to drain away from the battery and larger holes on the sides will allow a failed battery to vent with less impact to other parts of the battery.

New Battery Enclosure

The battery case will sit in a new enclosure made of stainless steel. This enclosure will isolate the battery from the rest of the equipment in the electronic equipment bays. It also will ensure there can be no fire inside the enclosure, thus adding another layer of protection to the battery system. The enclosure features a direct vent to carry battery vapors outside the airplane.

New titanium fixtures are being installed in the electronics equipment bays to ensure the housing is properly supported.

"Our first lines of improvements, the manufacturing tests and operations improvements, significantly reduce the likelihood of a battery failure. The second line of improvements, changes to the battery, helps stop an event and minimize the effect of a failure within the battery if it does occur. And the third line of improvements, the addition of the new enclosure, isolates the battery so that even if all the cells vent, there is no fire in the enclosure and there is no significant impact to the airplane," said Sinnett.

Testing Status

Testing to gain FAA approval of the battery enhancements has already started, with the FAA's permission.

During engineering testing, which occurs prior to certification testing, the team demonstrated that the new housing could safely contain a battery failure that included the failure of all eight cells within the battery. The "ultimate" load is the equivalent of 1.5 times the maximum force ever expected to be encountered during a battery failure. The housing easily withstood this pressure and did not fail until the pressure was more than three times the ultimate load.

Through another test, the team demonstrated that fire cannot occur within the new enclosure. Its design eliminates oxygen, making the containment unit self-inerting. Inerting is a step above fire detection and extinguishing as it prevents a fire from ever occurring. The design also vents all vapors by venting directly outside of the airplane rather than into the equipment bay.

"We put this new design through a rigorous set of tests. We tried to find a way to introduce a fire in the containment but it just wouldn't happen. Even when we introduced a flammable gas in the presence of an ignition source, the absence of oxygen meant there was no fire.

"We drew from the new industry standard, DO311, established by RTCA, to establish our testing plan," said Sinnett. "These standards weren't available when we set the testing plan for the baseline battery and they helped us ensure the new design is robust and safe. We intend to show, during certification, that the 787 battery meets all objectives of DO-311 and only deviates from specific requirements where the 787-unique items are not covered by the standards." RTCA is a not-for-profit organization that serves as a federal advisory committee in establishing guidelines for the aviation industry.

Working towards Resuming Flights

"We are following all of the necessary protocols to get our new design fully approved and properly installed so that we can help our customers start flying as soon as possible. We're simultaneously moving out on an effort to resume deliveries but completing our certification work and getting the delivered fleet flying again is our first priority," said Conner. "Our customers and their passengers have been incredibly patient as we have worked through this process and we thank them very sincerely for their continued support and confidence in the 787.

"The more-electric architecture of the 787 brings real value not just to the airlines but to our industry. By reducing fuel use, we are reducing our environmental footprint. This battery technology is an important part of the more-electric architecture, which is helping us to cut fuel use by more than 10 billion gallons of fuel over the life of this program.

"New technologies require extra attention and hard work, but the benefits are real."