

Why did NASA develop lithium-ion batteries?

When the Boeing 787's lithium-ion batteries had thermal issues, NASA helped establish ways to ensure cells flown on airliners didn't face the same problems. Today, these methods developed at NASA are a common way for manufacturers to test battery designs before they are flown.

Can a lithium-ion battery be used in space?

On the space shuttle Columbia flight STS-93, the first lithium-ion battery flown on a human spaceflight was used to power a video camera. While working at NASA's Johnson Space Center, Judy Jeevarajan devised the testing processes to ensure the battery was safe to use in space.

Did EnerSys launch a lithium-ion space battery?

READING, PA -- EnerSys (NYSE: ENS) has announced the successful launch of its ABSL(TM) lithium-ion space battery aboard NASA's Europa Clipper spacecraft. The mission, which took off on October 14, 2024,...

Does NASA have a Li-ion battery problem?

NASA has never had an issue with its Li-ion batteries, he says. "NASA has had an exceptional track record with no in-flight Li-ion battery incidents, but Boeing's experience made us realize we need to be prepared to manage this catastrophic hazard rather than trust it won't occur based on our screens alone.

Can a lithium ion battery run on Mars?

Mars and small body surface mission concepts require batteries capable of operating at -40°C. Current lithium-ion batteries (LIBs) have been adapted for low temperatures, but their performance is still limited below -20°C. Additionally, the gravimetric energy density of NASA LIBs is low.

Could a new frontier of battery research be more than lithium-ion batteries?

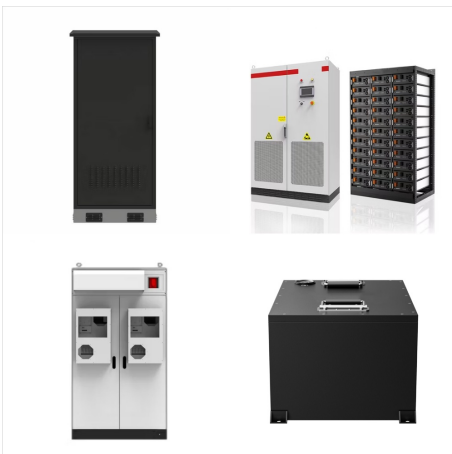
"SABERS continues to exceed its goals," said Rocco Viggiano, principal investigator for SABERS at NASA's Glenn Research Center in Cleveland. "We're starting to approach this new frontier of battery research that could do so much more than lithium-ion batteries can. The possibilities are pretty incredible."



Lithium-Ion Battery Safety Considerations for IEEE
Huntsville Power and Energy Society, February
2021 Penni J. Dalton NASA Glenn Research Center
ISS Battery Subsystem Manager. Page No. 2 ISS
Li-Ion Battery Safety Considerations ???



NASA Aerospace Flight Battery Program Page #: 1
of 49 NESC Request No.:06-069-I Guidelines on
Lithium-ion Battery Use in Space Applications
NASA Engineering Safety Center Battery Working
Group Prepared by Barbara McKissock, Patricia
Loyselle, and Elisa Vogel NASA Glenn Research
Center MARCH 2008



GOES-R Lithium-Ion Battery Life Test & Workhorse
Battery Performance NASA Aerospace Battery
Workshop 2018 November 27- 29, Huntsville AL .
Jon Tucker & Joseph Springer & Chengsong Ma.
Robert Bauer, Leonine Lee, Saft Space & Defense.
Lockheed Martin Space NASA Goddard.
Jon.R.Tucker@lmco



Battery Technical Discipline lead at NASA's Johnson Space Center discusses how a safety device he co-invented while at NASA for spaceflight impacts the entire battery industry. catastrophic event on that. This is a, a phenomena that's plagued the lithium-ion battery industry since the beginning, and it's, with good manufacturing it



Lithium-Ion Battery Status NASA Aerospace Battery Workshop November 19, 2019 Penni J. Dalton, NASA Glenn Research Center Ebony Bowens, The Boeing Company Tim North, The Boeing Company Sonia Balcer, Aerojet Rocketdyne. P4 Li-Ion Battery Operations ???Starting March 22, 2019, P4 Channels 4A operating in Mixed Configuration



The lithium-ion battery is favored by people because of its advantages of high energy density, long service life, high stability, and moderate price. On the accelerated life test platform developed by NASA, a 18650 lithium cobalate battery with a rated capacity of 2 Ah was used to carry out reference charge and discharge tests according to



However, in an experiment done by JPL, some capacity loss is seen among these latest lithium-ion battery cells under a high dosage of Cobalt-60. The results are shown below in figure 3.4 (62). A. Zimmerman and E. Jung. "Verification Sciences & Engineering Case Study of Counterfeit COTS Li-ion Cells." 2019. NASA Aerospace Battery workshop.



This data set has been collected from a custom built battery prognostics testbed at the NASA Ames Prognostics Center of Excellence (PCoE). Li-ion batteries were run through 3 different operational profiles (charge, discharge and Electrochemical Impedance Spectroscopy) at different temperatures. Discharges were carried out at different current load levels until the ???



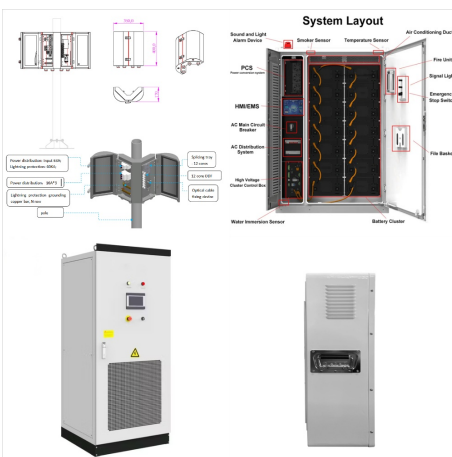
J. Jeevarajan, Ph.D. / NASA -JSC 14 Background
 ??? Lithium-ion cells, whether cylindrical, prismatic, elliptical, etc. have different forms of internal protective devices ??? PTC ??? CID ??? Tab/lead meltdown (fusible link type) ??? Bimetallic disconnects - etc. ??? External protective devices used in lithium-ion battery designs are ??? Diodes



simulation of a NASA Orion module battery pack
 Courtesy: Wikipedia, Dreamliner APU Li Ion Battery
 Pack. GT-SUITE Electric Aircraft Multi-physics
 Wang, D., Bao, Y., Shi, J., Online Lithium-Ion
 Battery Internal Resistance Measurement
 Application in State-of-Charge Estimation Using the
 Extended Kalman Filter, Energies, 2017, MDPI,
 doi:10.3390



Secondly, Li-ion battery safety is addressed with respect to thermal runaway and battery safety. Lastly, this course will lead the participants through the basic construction process of a thermal model of a Li-ion battery assembly that is capable of simulating nominal heating and thermal runaway heating.



Innovators at NASA Johnson Space Center have developed a carbon fiber reinforced polymer (CFRP) sleeve, that, when fitted over a cylindrical lithium-ion battery cell, can prevent cell-to-cell propagation by containing a thermal runaway (TR) event to the originating cell. TR is caused by a battery cell short-circuiting and its inability to



Lithium-Ion Battery Penni J. Dalton, NASA Glenn Research Center Sonia Balcer, Aerojet Rocketdyne . Page No. 2 - First flight Li-Ion battery delivered to Kennedy Space Center for shipment to Tanegashima, Japan ISS Li-Ion Technical Definition Studies . NASA Down Select to 4 cell candidates (April 2010) NASA Production



Lithium-Ion Battery NASA Aerospace Battery Workshop November 15, 2016 Penni J. Dalton, NASA Glenn Research Center ???March 2016 - First flight Li-Ion battery delivered to Kennedy Space Center for shipment to Tanegashima, Japan . ???



LITHIUM-ION BATTERY FUNDAMENTALS:
BATTERIES AND SPACE EXPLORATION TFAWS
2016 SHORT COURSE ON LITHIUM ION
BATTERIES 5 Lithium ion (Li-ion) batteries provide energy dense and low mass advanced energy storage solutions for a wide array of applications which include medical, industrial, railway, automobile, military and aerospace:



A NASA activity called SABERS, or "Solid-state Architecture Batteries for Enhanced Rechargeability and Safety," is researching how to create a safer battery by using brand-new materials and novel construction methods. The goal is to create a battery that has significantly higher energy than the lithium-ion batteries we currently use.



The Problem Current batteries under development will always have fire safety challenges due to flammable electrolytes used Safety is required for aerospace applications SOA lithium ion batteries have caused a number of safety incidents on aircraft Parasitic weight from excess packaging and cooling is undesirable Electric car Li-Ion Battery Fire



Lithium-Ion Battery NASA Aerospace Battery Workshop November 15, 2016 Penni J. Dalton, NASA Glenn Research Center Eugene Schwanbeck, NASA Johnson Space Center Tim North, The Boeing Company Sonia Balcer, Aerojet Rocketdyne. Page No. 2 ISS Li-Ion Battery - Outline



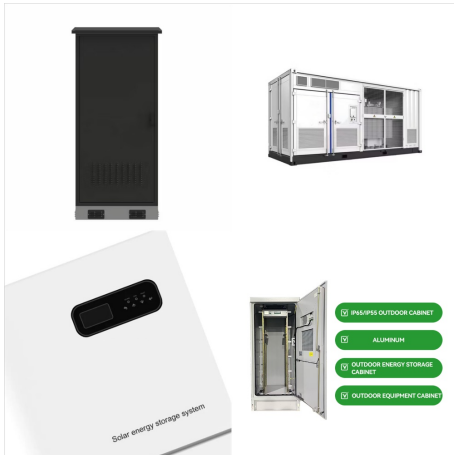
GOES-R PMR#6 ???Battery designed and manufactured by Saft in Cockeysville, Maryland. ???Life test battery built to flight drawings and processes. ???Battery acceptance test performed 2014 Feb -Jun ???VL48E cells ???Rated capacity (C r) = 45.4 Ah at 20°C ???Cr= required BOL capacity from 4.1 V to 3.0 V at Cn/2hr ???Cells formed in 2011 Mar ???Electrical Configuration



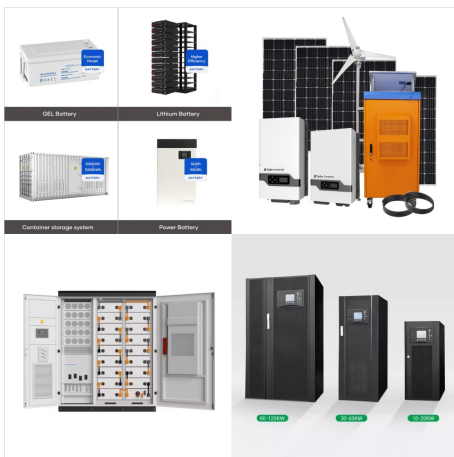
NASA Technology. The X-planes, experimental aircraft built by NASA and the military, started out by breaking the sound barrier in 1947 and have been pushing through invisible barriers ever since. Clarke notes that NASA had recently developed a lithium-ion-battery casing technique that filled an aluminum block with holes to hold the



Lithium-Ion Battery Status NASA Aerospace Battery Workshop November 2018 Penni J. Dalton, NASA Glenn Research Center Ebony Bowens, The Boeing Company Li-Ion Battery Orbit Operations Battery Location Start Up Capacity (Ahr), Jan. 2017 Annual Capacity (Ahr), Feb. 2018 1A1 113.1 111.0 1A2 109.7 107.5



NASA ADVANTAGES. Bipolar stack design .
Reduces safety containment weight and improves specific energy and power. Patented holey graphene . Improves cathode conductive architecture and battery performance. New sulfur-selenium combination . Optimizes performance by balancing energy lithium-ion batteries . Lithium-sulfur batteries . Solid



"International Space Station Lithium-Ion battery Safety considerations" ??? Dalton International Space Station (ISS) battery is the largest Li-ion battery to be flown on a manned mission Was a direct replacement for existing nickel-hydrogen (Ni-H. 2) batteries on orbit



Desired Battery Properties for NASA Missions
Reliable in meeting mission requirements.
State-of-Art (SOA) Li-Ion Battery (LIB) Study of
Prelithiated Silicon As Anode in Lithium-Ion Cells
Author: WU, JAMES J. (GRC-RPC0) Created Date:
2/14/2020 9:34:57 AM



A solid state battery provides firstly numerous safety advantages over traditional lithium ion technologies because it does not contain a flammable liquid electrolyte. A SSE would also allow for high energy density by volume, and if the battery contains lithium metal at the anode the energy density would increase meaning lighter batteries would