MANAGING LITHIUM BATTERY RISKS

TRANSPORTATION PERSPECTIVE

----- U.S. DOT VIEW -----

PROBABLE CAUSES OF INCIDENTS

- EXTERNAL SHORT
- INTERNAL SHORT
- IN USE SITUATION (CHARGING/DISCHARGING)
- NON-COMPLIANCE SITUATION

INCIDENT ANALYSIS(*preliminary)*

- **DATA COMPILED BY FAA, 1991-2007**
- **27% --- LITHIUM BATTERIES**
- **68% --- OTHER BATTERIES**
- **FOR LITHIUM BATTERIES --- 68% SHORT CIRCUITING (EXTERNAL AND INTERNAL), 15% CHARGING/DISCHARGING, 7% UNINTENTIONAL ACTIVATION OF DEVICES, 12% OTHERS**
- **FOR OTHER BATTERIES --- 70% SHORT CIRCUITING, 11% UNINTENTIONAL ACTIVATION OF DEVICES, 2% CHARGING/DISCHARGING, 17% OTHERS**

REDUCING INCIDENTS

- DESIGN AND MANUFACTURE BETTER LITHIUM ION BATTERIES
- RESPECT THE CHARGING LIMITATIONS OF LITHIUM ION BATTERIES
- PROPER USES AND HANDLING OF LITHIUM ION BATTERIES (IN AND OUT OF DEVICES)

INDUSTRY EFFORTS

- **BETTER CONTROL OF MANUFACTURING PROCESS TO PREVENT CONTAMINATION AND MINIMIZE DEFECTIVE PRODUCTS**
- **CHANGES TO BATTERY DESIGNS TO PREVENT THERMAL RUNAWAY POTENTIALS ARISING FROM INTERNAL SHORT**
- **DEVELOP SAFETY TESTING METHODS TO DETECT POTENTIAL DEFECTS OF BATTERIES**

BAJ AND IEEE 1625 PROJECTS

- BATTERY ASSOCIATION OF JAPAN (BAJ) IS DEVELOPING A TEST METHOD FOR DETECTING INTERNAL SHORT AND EVALUATION OF THE EFFECTIVENESS OF DESIGN CHANGES
- IEEE 1625 IS WORKING ON SAFETY STANDARDS FOR CELLS, BATTERY PACKS, AND HOST DEVICES IN INTEGRATED MANNER
- SIGNIFICANT SAFETY IMPROVEMENTS IN LITHIUM ION BATTERY AND HOST DEVICES CAN BE EXPECTED WHEN ALL THESE EFFORTS ARE IN PLACE

WHAT WE KNOW AND DO NOT KNOW

- DO --- NEWLY MANUFACTURED LITHIUM ION BATTERIES CAN BE MADE SAFE FOR TRANSPORT AND USE
- DON'T --- CONDITIONS AND ENVIRONMENTS THE BATTERIES OR HOST DEVICES ARE SUBJECTED TO WHEN THEY ARE IN THE HANDS OF CONSUMERS

MANAGING THE RISKS

- **ASSUME, WHILE RECOGNIZING IMPRESSIVE PROGRESS HAS BEEN MADE BY INDUSTRY, THAT LITHIUM ION BATTERIES HAVE THE POTENTIAL OF THERMAL RUNAWAY CONDITIONS IF ABUSED AND MAY CAUSE OVERHEATING OR FIRE**
- **NEED A PRACTICAL REGULATORY SCHEME TO ENSURE PUBLIC SAFETY WHILE NOT IMPEDING TECHNOLOGY ADVANCEMENT AND TRANSPORTATION NEEDS**