



Certification of 787 Battery Solution

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Battery Solution Approved

- The U.S. Federal Aviation Administration has approved Boeing's comprehensive set of solutions to address 787 battery concerns
- Certification clears the way for next steps:
 - ❖ Modification work begins
 - ❖ Battery shipments begin



Clears the Way to Begin Return-to-Flight Process

Approval Follows Robust 3 Month Effort

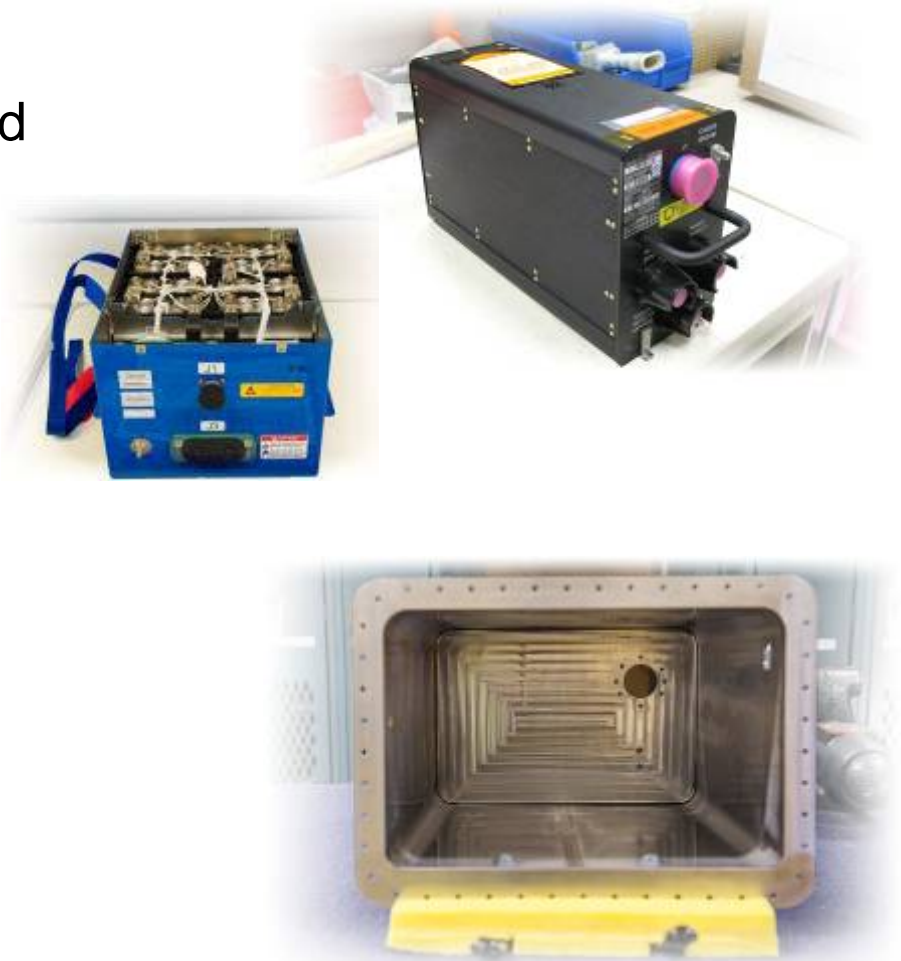
- Teams deployed to support NTSB/JTSB investigations
- Technical team activated to analyze potential faults
- Development team gathered to create solutions
- Industry experts reviewed work, concurred with findings and solution
- Regulatory coordination part of process from Day 1



+ 200,000 Engineering Hours Applied

Three Layers of Protection

- Manufacturing Improvements
 - ❖ Enhanced cell and battery build processes
 - ❖ Enhanced production tests for cells and batteries
- Design Enhancements
 - ❖ Charger design improvements
 - ❖ Tightened voltage range
 - ❖ Battery design improvements
- Enclosure System
 - ❖ Added battery enclosure



Comprehensive Set of Solutions

Robust Certification Testing of Solution

Component Performance

- Burst disc
- Burst disc indicator
- Cell flammability
- Electromagnetic energy isolator
- Seal performance

Battery Performance

- Toxicity levels
- Performance at altitude with depressurization event
- Hot day/high load performance

Enclosure Performance

- Ability to contain a full-battery failure

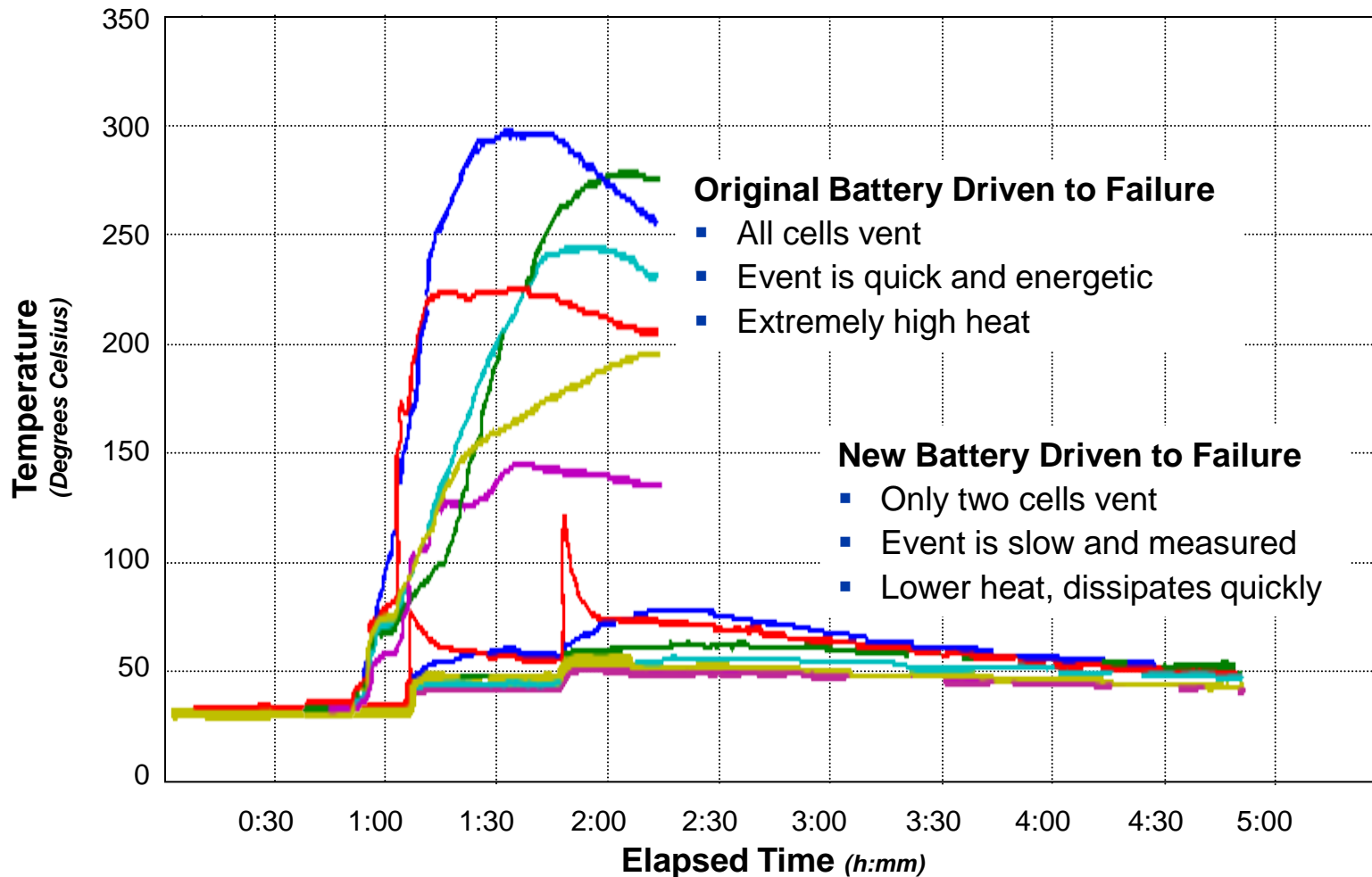
Airplane Performance

- Normal conditions
- Battery failure and venting



More Than 100,000 Hours Devoted to Testing

Lab Testing Validates Improvements



New Battery Performance Shows Improvement

AOG Services Team Deployment Plans

- Ten teams with +300 AOG employees
- Performing on-site, comprehensive modifications to return 787s to service
- Battery work requires about five days per airplane
- Skills include advisors, engineers, quality inspectors and mechanics
- Capabilities include diagnosis, repair, logistics, parts procurement, warranty and certification



People Ready to Help Airlines Return to Flight

Battery Improvements Kit Contents

- Spares Distribution Center ships kits to each customer
- Each kit contains:
 - ❖ Pieces required to install stainless steel battery enclosures
 - ❖ Vent line assembly pieces
 - ❖ Battery charger
 - ❖ Wire bundles
 - ❖ Associated hardware
- Batteries shipped from manufacturer to airline for installation



Parts Ready to Help Airlines Return to Flight

Locations of 787s Today

- Chile
 - ❖ Santiago (3)
- Ethiopia
 - ❖ Addis Ababa (4)
- Germany
 - ❖ Frankfurt (1)
- India
 - ❖ Mumbai (6)
- Japan
 - ❖ Haneda (11)
 - ❖ Kumamoto (1)
 - ❖ Matsuyama (1)
 - ❖ Narita (8)
 - ❖ Okayama (1)
 - ❖ Takamatsu (1)
- Poland
 - ❖ Warsaw (1)
- Qatar
 - ❖ Doha (4)
- United Kingdom
 - ❖ London (1)
- United States
 - ❖ Boston (1)
 - ❖ Chicago (1)
 - ❖ Houston (4)
 - ❖ Los Angeles (1)



Teams Being Deployed to Implement Improvements

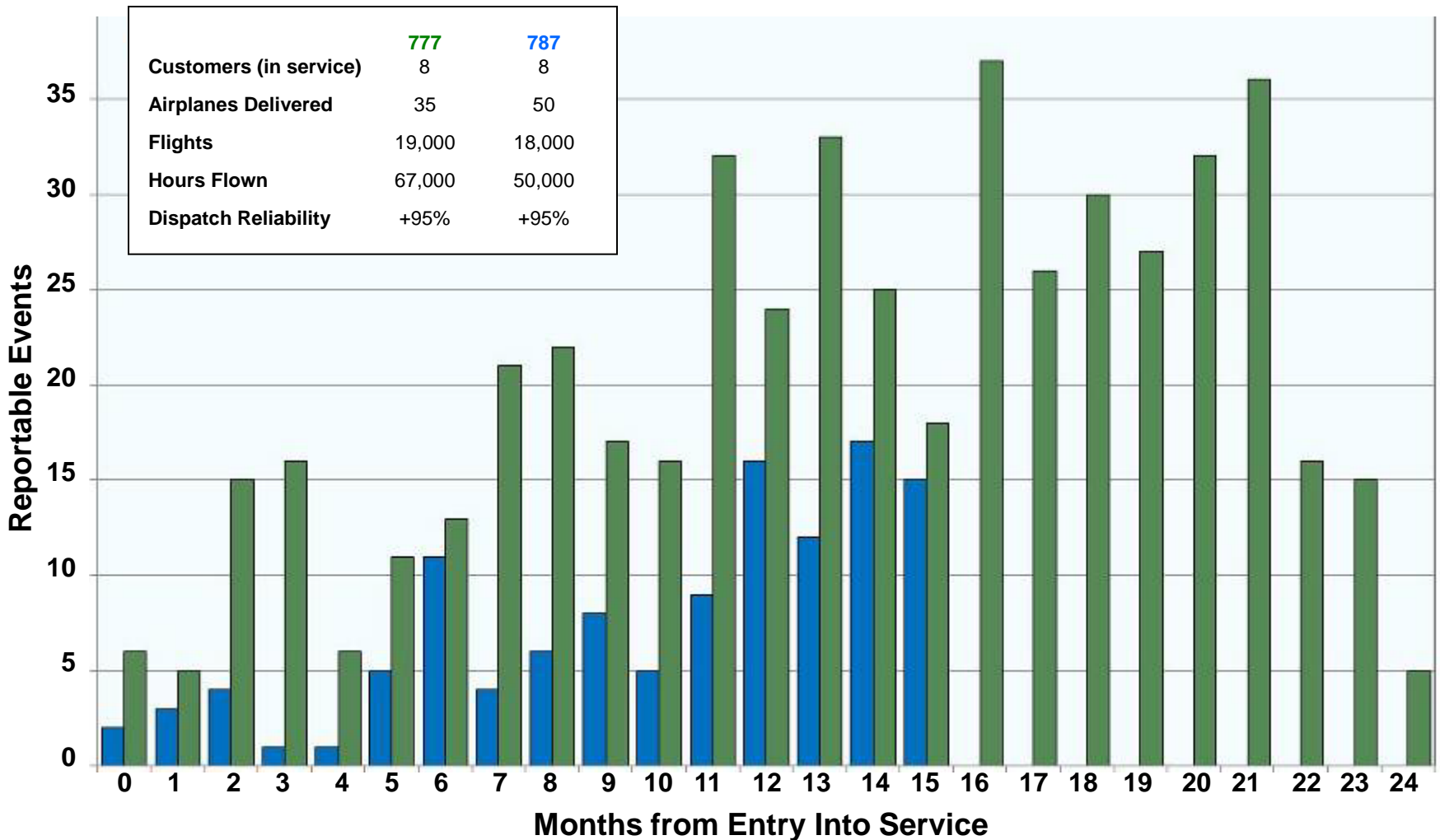
Improving Airplane Reliability

- Addressing component reliability improvements concurrent with new battery system installments
- Each airline is customizing work packages based on its needs



Continuous Improvement of Reliability

787 Compares Favorably to 777



Issues Arise Early In Service and We Address Them

Your Safety Is Our Priority

- We have applied vast resources to understand the battery events
- Our focus has been on developing a comprehensive set of solutions that addresses causal factors
- We look forward to flying with you on the 787 soon



The 787 Continues the Proud Boeing Legacy of Safety

Go-Forward Plan

- ✓ Complete certification testing and analysis
- ✓ Resume Boeing production test flights
- ✓ Certification
 - Fleet installations
 - Operational approval
 - Airlines return to flight
 - Resume deliveries



Summary

- Safety is the top priority
- Extensive testing validates effectiveness of battery solution
- Team and parts are staged and ready
- Our customers are eager to return to flight



The 787 Is a Great Airplane

