平成 27 年 6 月 23 日
運輸安全委員会

米国連邦航空局に対する安全勧告に関するフォローアップについて

運輸安全委員会は、平成 25 年 1 月 16 日に東京国際空港に向けて山口宇部空港を離陸し、四国上空を上昇中、メインバッテリーの不具合を示す計器表示とともに、操縦室内で異臭が発生したため、目的地を高松空港に変更し、高松空港に着陸した全日本空輸（株）所属ボーイング式 787-8 型 JA804A 航空重大インシデントの調査において、平成 26 年 9 月 25 日に航空事故調査報告書の公表とともに米国連邦航空局（FAA）に対して安全勧告を行ったところですが、今般、安全勧告に対する措置状況について通知がありました。概要は以下のとおりです。

１．安全勧告

米国連邦航空局が講ずべき措置

(1) 航空機装備品の試験が実運用を適切に模擬した環境で行われるよう航空機製造者及び装備品製造者を指導すること。

(2) ＬＩＢ試験において電気的環境が適切に模擬されるように、技術基準を見直し、必要があれば技術基準の改正を行うこと。

(3) 同型式機のＴＣ時のＬＩＢの故障率の想定について見直しを行い、その結果を踏まえ、必要があればＬＩＢの安全性評価の見直しを行うこと。

(4) 同型式機のＴＣにおいて、セル間の熱伝播リスクが適切に評価されているか見直しを行うこと。

(5) 同型式機のセルがベントした後に発生するコンタクターの動作が、運航に与える影響を検討し、その結果を踏まえ、必要な措置を講じること。

同機の設計・製造者であるボーイング社に対して指導すべき措置

(1) エレメントの不均一な成形及び他の製造工程に起因する事象との関連の可能性も踏まえ、内部短絡の発生機序について更に調査を継続すること。また、その結果を踏まえ、さらなるＬＩＢの品質と信頼性の向上を図るとともに、温度等のＬＩＢの運用条件についても見直しを行うこと。

(2) 設計時には想定されていないＢＣＵの動作及びコンタクターの動作確認について改善を図ること。

２．米国連邦航空局（FAA）からの通知（要約）

米国連邦航空局が講ずべき措置

(1)(2) ＬＩＢの新たな基準を策定し、実運用を模擬して航空機装備品の試験を行うこととした。

(3)(4)(5)バッテリーシステムは再設計され、新しいＬＩＢ安全評価に基づいて承認されており、また、熱伝播リスクにも明確に対応した。

同機の設計・製造者であるボーイング社に対して指導すべき措置

(1)(2)バッテリーセル設計を継続的に見直す過程において、ボーイング社は内部短絡の発生メカニズムの研究を継続し、ＬＩＢの製造過程も調査している。これにはＢＣＵとコンタクターの動作の改善も含まれている。

U.S. Department
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MAY 20 2015

Norihiro Goto
Chairman
Japan Transport Safety Board
2-1-2, Kasumigaseki
Chiyoda-ku, Tokyo, 100-8918
Japan

Dear Mr. Goto:

This is our initial and final response to Safety Recommendations 15.013 through 15.019 issued by the Japan Transport Safety Board (JTSB) on September 25, 2014. The Federal Aviation Administration (FAA) Office of Accident Investigation and Prevention received these recommendations through the National Transportation Safety Board on January 15, 2015. The JTSB issued these recommendations as a result of a serious incident that occurred on January 16, 2013. A Boeing 787-800 (B-787), operated by All Nippon Airways Co., LTD., registered JA804A, took off from Yamaguchi Ube Airport for Tokyo International Airport as its scheduled flight 692. When it was climbing through 32,000 feet over Shikoku Island, an Engine Indicating and Crew Alert System message of battery failure came on accompanied by an unusual smell in the cockpit. The airplane diverted and landed at Takamatsu Airport. An emergency evacuation was executed using slides on the taxiway. Four passengers of the 137 occupants (which included the Captain, seven crewmembers, and 129 passengers) suffered minor injuries during the evacuation. Although the main battery was damaged, it did not lead to a fire.

Incidentally, a similar incident occurred in the United States, on January 7, 2013, at Logan International Airport (BOS), Boston, Massachusetts. Additionally, about one year after the incident at BOS, a similar main battery incident occurred at Japan's Narita International Airport on January 14, 2014.

15.013. Provide instruction to airplane manufacturers and equipment manufacturers to perform equipment tests simulating actual flight operations.

15.014. Review the technical standards for lithium ion battery to ensure that the electric environment is appropriately simulated, and if necessary, amend the standards.

FAA Comment. The FAA worked with industry experts to develop new Lithium battery and battery system standards that require applicants to perform equipment tests simulating actual flight operations, including a simulation of the worst-case failure condition. On

December 18, 2013, these revised standards were released in Radio Technical Commission for Aeronautics (RTCA) DO-347, Certification Test Guidance for Small and Medium Sized Rechargeable Lithium Battery and Battery System. These standards are being applied to large batteries through the issue paper process pending final release of RTCA DO-311a by September 2015. RTCA DO-347 can be found at the following Web site:

http://www.rtca.org/store_product.asp?prodid=1124.

These standards were developed to ensure that the electric environment is appropriately simulated, and include testing based on in-service lessons learned that simulate actual aircraft installation and flight operation. The standards have been revised to include design review and testing processes intended to verify that the battery system meets all design and performance requirements for aircraft application.

15.015. Review lithium ion battery failure rate estimated during the 787 type certification, and if necessary, based on its result, review the lithium ion battery safety assessment.

15.016. Review the type certificate for its appropriateness on heat propagation risk.

15.017. Assess the impact of contactor opening after the cell vent on the flight operation and take appropriate actions, if necessary.

15.018. Supervise Boeing to continue the study of internal short circuit mechanism considering the effects of non-uniform winding formation and other factors deriving from the manufacturing process; and continue efforts to improve lithium ion battery quality and its reliability, reviewing the lithium ion battery operational conditions, such as temperature.

15.019. Supervise Boeing to improve Battery Charger Unit (BCU) and contactor operations which are outside the design envelope.

FAA Comment. The B-787 Main and Auxiliary Power Unit (APU) batteries, their associated systems, and enclosure were redesigned and are significantly different than what was certified during the initial B-787 type certification. Accordingly, approval of the redesigned system was based on a new lithium ion battery safety assessment.

Certification of the redesigned system and enclosure specifically addressed heat propagation risk. Two in-service battery cell thermal events on airplanes with the new battery and enclosures have not propagated beyond the battery enclosure, per design.

Certification of the redesigned system and enclosure specifically addressed cell venting events and subsequent isolation of the battery. The enclosure with overboard venting is designed to mitigate and contain a cell venting event. Loss of a Main or APU battery as a power source will not preclude continued safe flight and landing. Two in-service battery cell thermal events on airplanes with the new battery and enclosures have not had airplane level effects outside of the enclosure and have not had system level effects beyond loss of the associated battery as a power source, per design.

In an effort to continually improve the battery cell design, Boeing is continuing to study the internal short circuit mechanism and examining the build procedure for the lithium ion battery.

This included improvements to the Battery Charger Unit (BCU) and contactor operations. Two in-service battery cell thermal events on airplanes with the new battery and enclosures have not had airplane level effects outside of the enclosure and have not had system level effects beyond loss of the associated battery as a power source, per design. The BCU and contactor functioned per design.

Based on the actions noted above, the FAA does not intend to conduct any further review of the original lithium ion battery safety assessment.

I believe that the FAA has effectively addressed safety recommendations 15.013 through 15.019 and consider our actions complete.

The FAA would like to thank the JTSB for submitting FAA Safety Recommendations 15.013 through 15.019 and its continued interest in aviation safety. If you have any questions, or need additional information regarding these safety recommendations, please contact

(Name and Phone Number)

Sincerely,

(Original signed)

Director, Office of Accident Investigation
And Prevention