



U.S. Department  
of Transportation  
**Pipeline and Hazardous  
Materials Safety  
Administration**

1200 New Jersey Ave., S.E.  
Washington, DC 20590

JUN 26 2007

Mr. Marshall S. Filler  
Obadal, Filler, MacLeod  
& Klein, P.L.C.  
117 North Henry Street  
Alexandria, VA 22314-2903

Ref. No. 07-0051

Dear Mr. Filler:

This responds to your letter dated January 16, 2007, concerning the applicability of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to a cargo container that includes an independent and automatic cooling system powered by a rechargeable lithium-ion battery. The cargo container, identified as the Kelvinbox Tracking Environmental Deviation System (T.E.D.S.), is loaded into the cargo compartment of an aircraft. It is your understanding of § 175.8(a)(2) of the HMR that such a cargo container (LD3) containing regulated hazardous materials operating in flight as part of a process would be excepted from the HMR as "hazardous materials required aboard an aircraft in accordance with the applicable airworthiness requirements and operating regulations."

Your understanding is not correct. The HMR except hazardous materials required aboard an aircraft in accordance with applicable airworthiness requirements (e.g., fuel, batteries) and operating regulations (e.g., supplemental crew oxygen, oxygen generators, emergency egress systems). The T.E.D.S. unit you describe does not appear to fall into either category. As such, the lithium-equivalent content of the lithium-ion battery (42 grams) used to power the T.E.D.S. cargo container would indicate that it is fully regulated under the HMR. See 49 CFR 173.185. In addition, the gross weight of the lithium-ion battery (41.3 kg) would indicate that it is forbidden on passenger-carrying and cargo-carrying aircraft. See Column (9B) of the "lithium battery" entry in the § 172.101 Hazardous Materials Table and § 172.102, Special Provision A100.



070051

175.8(a)(2)

As a related matter, we are also aware that the T.E.D.S. cargo containers may be subject to operations and certification standards required by the Federal Aviation Administration.

You may suggest that your client apply for a special permit as provided in § 107.105 of the HMR. The Special Permits office may be reached at (202) 366-4535.

I trust this adequately addresses your concerns. Please contact us if we can be of further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Hattie L. Mitchell", with a stylized flourish at the end.

Hattie L. Mitchell  
Chief, Regulatory Review and Reinvention  
Office of Hazardous Materials Standards

Obadal, Filler,  
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Stevens  
§175.8  
Exceptions  
07-0051

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January 16, 2007

VIA E-MAIL TO:

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James J. Ballough  
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Robert A. Richard  
Acting Associate Administrator for  
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Department of Transportation  
400 Seventh Street, SW  
Washington, DC 20590-0001

Re: Refrigerated Cargo Container

Dear Sirs:

We represent Tednologies, Inc. We are writing to request Federal Aviation Administration (FAA) and Pipeline and Hazardous Materials Safety Administration (PHMSA) concurrence in the following plan for obtaining approval of a cargo container that includes an independent and automatic cooling system powered by a rechargeable lithium-ion battery. Once FAA approval has been obtained, we believe the unit would be excepted from the Hazardous Materials Regulations (HMR) as required equipment pursuant to 49 CFR § 178.8(a)(2).<sup>1</sup>

### Background

The unit, presently identified as the Kelvinbox Tracking Environmental Deviation System (T.E.D.S.), is essentially an LD3 cargo container. Its purpose is to transport temperature sensitive goods as freight aboard passenger and cargo aircraft.

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<sup>1</sup> Which provides, in part, that:

(a) Operator equipment. This subchapter does not apply to—

...

(2) Hazardous materials required aboard an aircraft in accordance with the applicable airworthiness requirements and operating regulations. Items of replacement for such materials must be transported in accordance with paragraph (a)(3) of this section. (*Emphasis added*)

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A prime application of this technology is the shipment of pharmaceuticals which are extremely susceptible to heat during loading and unloading of aircraft, and therefore difficult to transport as air cargo. We have also received a great deal of interest from those involved in delivering perishable goods to remote locations, primarily within the state of Alaska.

While the T.E.D.S. container is covered by FAA Technical Standard Order (TSO) TSO-C90c, titled "Cargo Pallets, Nets, and Containers," the integrated cooling system is not.

We have learned in recent conversations with FAA personnel that the Aircraft Certification Service (AIR) and Flight Standards Service (AFS) have been reviewing this matter. Our understanding is that the issues being discussed relate primarily to the manner of obtaining a design approval and how maintenance would be performed on the units.

#### **Kelvinbox T.E.D.S. Description**

The container is a rigid and insulated structure designed to meet the requirements of FAA TSO-C90c. In this regard, it is similar to many containers approved through this TSO.

The distinctive feature is the integrated autonomous cooling system. Unlike "passive" cooling of containerized cargo using dry ice, gel packs or other cooling media, the container is "active" in that it monitors and maintains a pre-determined temperature using a traditional mechanically operated refrigerant cooling system.

Power for the cooling and monitoring system is provided by a rechargeable lithium-ion battery. This battery is only charged on the ground by plugging a cord into a conventional electrical outlet; the process will not take place while the container is on-board the aircraft. The design includes protective circuitry – a "fuse" to prevent a rapid discharge (external load) and cell to cell "fuses" to cut off an internal (battery) short.

#### **Certification and UN Testing History**

Initial steps toward certification under TSO-C90c were taken through ASW-190 (TSO application SP8352SC-Q). That application is dormant and will be withdrawn in the near future as we finalize the design and manufacturing details.

Because exclusive production of the container will occur in Alaska, the application under TSO-C90c will be submitted to the Anchorage, Alaska ACO and the manufacturing quality system will be under the jurisdiction of the Wichita MIDO.

In addition to operational testing of the air conditioning module itself, the following tests have been successfully completed on the container assembly and documented accordingly:

- Temperature variation
- Temperature and altitude
- Ultimate load
- Rapid decompression
- Electromagnetic emissions
- Crash safety impulse
- Operational shock
- Burning rate

The lithium-ion battery has passed all required testing pursuant to United Nations/International Civil Aviation Organization HAZMAT requirements.

#### **Proposed Plan**

*Design approval issues:* We propose that Notice 8150.4, titled "Non-TSO Function(s) Integrated into TSO Articles," (Notice), be used to evaluate the design of the integrated cooling system as further described below. This would be accomplished during the Technical Standard Order Authorization (TSOA) application process under TSO-C90c and the criteria set forth in the Notice.

There is no aircraft to ULD interface other than the usual aircraft restraint or locking device. Based on the criteria set forth in paragraph 4 of the Notice (see below), we believe that all pertinent design issues can be resolved through the above process and without the necessity for a Supplemental Type Certificate (STC).

*Operations and maintenance issues:* Operational issues would be addressed as outlined in Advisory Circular (AC) 120-85 titled "Air Cargo Operations." Specifically, each operator would be responsible for ensuring that the carriage of these containers was authorized in accordance with its Weight and Balance and/or Cargo Loading Manuals. Since the TSOA process requires an applicant to provide instructions for maintaining the units and other pertinent continued airworthiness information, that issue can also be resolved within the proposed framework.

#### **Hazardous Materials Regulations**

Once FAA approval has been granted, the lithium-ion battery would then be excepted from the Hazardous Materials Regulations (HMR) as "required equipment" under 49 CFR § 175.8(a)(2).<sup>2</sup>

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<sup>2</sup> See *supra* note 1.

As noted in the preamble to the final rule titled "Prohibition of Oxygen Generators as Cargo in Passenger Aircraft" by the predecessor agency to PHMSA, the Research and Special Programs Administration (RSPA): "RSPA does not regulate, and the HMR do not apply to, components of the aircraft itself."<sup>3</sup>

### **Approval of Non-TSO Functions**

Although the project has thus far resulted in some confusion among ASW-190 staff about how the container should be approved, Notice 8150.4<sup>4</sup> sets forth the pertinent guidance. Specifically, paragraph 4, titled "Policy" provides as follows:

**a. Definition of a Non-TSO Function.** A non-TSO function is one that is not covered by a TSO-approved minimum performance standard (MPS), does not support or affect the hosting article's TSO function(s), and could technically be implemented outside of the TSO article. A manufacturer may choose to integrate a non-TSO function into a TSO article to support a foreign airspace requirement; minimize the amount of line replaceable units and interconnect wiring systems in an aircraft installation; address a specific customer/industry need; or for product differentiation. Non-TSO function(s) may be included and accepted on a non-interference basis, as part of a manufacturer's TSO submittal, and a TSO authorization issued for the article, if the manufacturer demonstrates that it meets all of the following conditions:

- (1) The hosting article is eligible for TSO authorization and meets the applicable TSO performance requirements, per FAA Order 8150.1B, Paragraph 17a(1) and 17a(2);
- (2) There is no applicable TSO for the non-TSO function;
- (3) The added non-TSO function does not affect or interfere with the hosting TSO article's required MPS or violate any limitations imposed by the hosting TSO; and,
- (4) The hosting TSO article's environmental qualification, hardware and software design assurance levels adequately support the non-TSO function. (*Emphasis added*)

The non-TSO cooling function should therefore be accepted as part of the TSO submittal because it meets this definition and satisfies the stated conditions: It is not addressed in the relevant TSO; its presence has no impact on the TSO-C90c performance standard; and the container, or "hosting article," meets the standard. The

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<sup>3</sup> 61 FR 68952, December 30, 1996.

<sup>4</sup> The Order is dated September 29, 2006, with a cancellation date of September 29, 2007.

final stated condition is inapplicable because there is no design interface between the cooling system and the container structure other than structural support.

### **FAA Engineering Review**

The same paragraph in the Notice also provides guidance for an engineering evaluation:

**d. ACO Evaluation Criteria.** If, following early coordination between the ACO and the manufacturer, it is determined that the non-TSO function is of a simple nature where the performance is easily understandable, ACO review of the manufacturer's declared performance requirements should simply become part of the normal TSO data application evaluation. However, the ACO should require a concurrent Type Certificate (TC) or Supplemental Type Certificate (STC) project evaluation if it is determined that the added non-TSO function(s): (*Emphasis added.*)

- (1) Is complex and difficult to review and fully understand without a concurrent installation evaluation;
- (2) Has a high degree of system flight deck to pilot interface;
- (3) Are of a simple nature individually but combined in such a way or in sufficient quantities to meet the criteria of 4d(1); or
- (4) Incorporates new or novel technology.

The non-TSO cooling function is of basic design. It is not complex individually or when combined with other such containers, it has no flight crew interface, and it is a not new or novel technology.

In fact, a similar version of the most technologically advanced aspect of container, the lithium-ion battery, is currently approved to power the emergency lighting system on the Airbus A380 aircraft.<sup>5</sup> Concerns identified in granting that approval are largely inapplicable in our situation. Specifically, the risks associated with overcharging will not apply because the container is not recharged on the aircraft; reduced capacity that results from over-discharging would only result in reduced cooling capacity; and the battery does not utilize flammable liquid electrolyte.

Since there will be no unique interface with the airplane, evidence that an STC is not necessary can be found in paragraph 315 of AC 120-85, which states, in part, that:

As appropriate to the type design, the specification of which ULDs are compatible with the particular airplane should be identified in the airplane

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<sup>5</sup> See, "Special Conditions: Airbus Model A380-800 Airplane, Lithium-Ion Battery Installation," docket No. NM352; Special Conditions No. 25-339-SC.

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weight and balance or cargo loading document. This is the primary means for ensuring the proper ULDs are used in the operation of the airplane.  
(Emphasis added)

As such, installation of the container would be governed by the Weight and Balance Manual and/or Cargo Loading Manual of the aircraft on which it is loaded.

Finally, Notice 8150.4, Appendix 2, paragraph 5 specifically states that:

**Q: Is a deviation request (reference 14 CFR §21.609) required when a manufacturer incorporates a non-TSO function in a TSO article?**

A: No. The addition of a non-TSO function is not considered a deviation to the hosting TSO article. In fact, the policy of this Notice requires the manufacturer to demonstrate to the TSOA-issuing ACO that the non-TSO function in no way impacts the required performance of the hosting TSO article.

In summary, we propose that the FAA evaluate the design of the T.E.D.S. container under TSOA-C90c (as supplemented by Notice 8150.4) without the necessity of an STC. We will work closely with the FAA during the TSOA process to ensure that appropriate continuing airworthiness information is provided. Further, because the equipment would be carried in accordance with the airworthiness, operations and maintenance rules, we submit that it would be excepted from the HMR under 49 CFR § 175.8(a)(2).

We hope this letter explains the article and clarifies the issues related to the anticipated application under TSO-C90c with the Anchorage ACO. Please let me know if you have any questions or require further information.

Sincerely,



Marshall S. Filler

cc: Dave Cann (AFS-300)  
Dave Hempe (AIR-100)  
Ali Bahrami, Manager, Transport Airplane Directorate (ANM-100)  
Gregory J. Holt, Manager, Anchorage ACO (ACE-115N)  
Margaret Kline, Manager, Wichita MIDO (ACE-115W)