Before The:

U.S. DEPARTMENT OF TRANSPORTATION

PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

Docket No. PHMSA-2009-0095 (HM-224F)

THE PROPOSED RULE CANNOT BE JUSTIFIED BY PHMSA'S COST-BENEFIT ANALYSIS

On Behalf of PRBA - The Rechargeable Battery Association

Rebuttal Analysis Prepared by:

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Washington, D.C. March 12, 2010

EXECUTIVE SUMMARY

The Pipeline and Hazardous Materials Safety Administration ("PHMSA") has utterly failed to meet any reasonable test of benefit-cost justification for its proposed rule. In reality, the benefit-cost ratio is less than one cent of benefits per dollar of cost. The most significant deficiencies in PHMSA's cost-benefit analysis are highlighted below.

Summary

- PHMSA has not conducted a thorough and competent empirical analysis of either purported rule-related air safety benefits or the significant cost and time impacts on the commerce of cellular phones, notebooks, and other affected products.
- PHMSA's estimate that the first year cost of implementing the proposed rule would be $9.39 million is wrong. CAC/Transystems estimates the first year cost at $1.127 billion.
- PHMSA's estimate that the 10-year cost of implementing the proposal rule would be $70.6 million is wrong. CAC/TranSystems estimates 10-year direct costs to shippers of $8.5 billion.
- PHMSA's estimate that the 10-year benefits of the proposal rule would be $228.2 million is also wrong.[1] CAC/TranSystems estimates benefits of $1.4 million.
- When PHMSA's errors are corrected, the benefits of the proposed rule are less than 0.1% of costs.

Benefits

- PHMSA's benefits estimates are based upon irrelevant and erroneously applied data that bear no relation to the real-world experience.
- PHMSA has provided no historical evidence of any aircraft accidents or damage, or any personal injuries or deaths, due to the transportation by air of lithium ion batteries or products that contain them.

[1] This is PHMSA's estimate for saved damages plus the savings of one catastrophic airplane crash (see computation described in Table 5-1).

- Without any basis in historical fact or experience, PHMSA's benefits assume the savings of a catastrophic aircraft loss during the next 10 years. This method is in direct contradiction of standard FAA methodology for aviation safety benefits analysis.

Costs

- The proposed rule will significantly affect all aspects of the highly sophisticated logistics systems for electronic products, leading to higher costs and slower delivery for U.S. consumers. PHMSA failed to research or understand the broad upheaval in global supply chains and distribution methods that would be caused by the rule.
- PHMSA's costs are incomplete, based on simple assumptions and, in some cases, calculated erroneously. Its simplified analysis ignores distinctions between vastly different products and manufacturers' supply chains and greatly underestimates costs by shifting products into large consolidated shipments that would not occur.
- PHMSA wrongly assumes that there will be no growth in affected trade flows and associated cost impacts over the next ten years, despite acknowledging that sales of lithium ion cells and batteries increased 13% per year from 1998 to 2008. Thus, PHMSA's estimated costs are artificially low.
- If two simple corrections are made to PHMSA's analysis, the 10-year costs nearly triple from $70.6 million to $191.8 million.
- PHMSA underestimated the volume of products that would be directly affected by 92% (16.7 million units vs. 204 million units) and ignored the cumulative effect on shipments using multi-flight itineraries.
- PHMSA did not consider the effect on foreign-to-foreign trade flows, either directly or via the U.S. But U.S. airlines such as FedEx and UPS are highly dependent on these markets.
- PHMSA ignored all rule-related costs for higher cost hazmat handling by airlines and other logistics service providers, and for increased inventory costs due to transport delays.

- Use of publicly available foreign trade statistics and industry-specific distribution patterns increases PHMSA's estimated annual costs from $9.4 million to over $1.1 billion.
- PHMSA failed to consider that U.S. distribution centers may very well be relocated to Mexico and/or Canada if the rule is implemented as proposed, with a loss of U.S. jobs, payroll and revenues.

The tables below summarize the glaring deficiencies in PHMSA's cost-benefit analysis.

Comparison of Annual Cost Impacts (in Millions)

Cost Element	PHMSA	Corrected PHMSA	CAC/ TranSystems
Packaging	$8.67	$22.92	$182.43
Training	$0.67	$2.55	$4.74
Transport and Related Services	$0.05	$0.05	$338.58
Logistics	$0.00	$0.00	$377.80
U.S. Trade Sub-total	**$9.39**	**$25.52**	**$903.55**
International Trade Impacts on U.S. Companies	**$0.00**	**$0.00**	**$223.53**
Total U.S. Impacts	**$9.39**	**$25.52**	**$1,127.08**

Comparison of Net Present Value of Ten-Year Benefit-Cost Estimates (in Millions) /1

	PHMSA	PHMSA Corrected	CAC/ TranSystems
A. BENEFITS			
- Without Catastrophic Aircraft Loss	$75,150	$7	$7
- With Catastrophic Aircraft Loss	$228,207 /2	$1,407	$1,407
B. COSTS	$70,560	$191,800	$8,470,240
C. BENEFIT-COST RATIOS			
- Without Catastrophic Aircraft Loss	**1.07 to 1.00**	**< 0.001 to 1.00**	**< 0.001 to 1.00**
- With Catastrophic Aircraft Loss	**3.23 to 1.00**	**0.01 to 1.00**	**< 0.001 to 1.00**

1/ Based on a 7% discount rate

2/ Weighted average of cargo aircraft and passenger aircraft in a ratio of 16:1 (see Section 5.0, Table 5-1).

1.0 Introduction

On January 11, 2010 the Pipeline and Hazardous Materials Safety Administration ("PHMSA") issued a Notice of Proposed Rulemaking ("NPRM" or "proposed rule" or "rule") affecting the methods and practices of transporting certain batteries, battery packs, and products containing lithium ion or lithium metal cells. Because of the profound and widespread economic damage this rule would inflict upon the affected products, U.S. air carriers, the U.S. workforce, the U.S. economy, and U.S. foreign trade, PRBA - The Rechargeable Battery Association ("PRBA") retained the economic consulting team of Campbell Aviation Consultants, LLC ("CAC") and TranSystems, Inc. ("TranSystems") to evaluate the economic consequences of the proposed rule, and to analyze and assess the prospective costs and benefits that would result from implementation of the rule.

The CAC/TranSystems team[1] has reviewed relevant documents and several U.S. government and commercial databases, and with the assistance of PRBA it conducted a survey of seven Association members on the rule's impact on their businesses[2]. The survey included telephone conferences with each respondent to explain all aspects of the survey instrument, the data and qualitative information sought, and to answer questions from respondents. The survey was designed, executed, and compiled by CAC/TranSystems.

The survey findings and results form an integral part of the CAC/TranSystems cost-benefit analysis. Because the PHMSA cost-benefit analysis is so incomplete, so devoid of empirical research and defensible inputs, and so laden with unjustified and unsupported assumptions, CAC/TranSystems had to conduct its own cost-benefit study. It could not rely upon any of the analysis provided in the PHMSA study.

Section 2.0 of this report contains a brief summary of our findings and highlights of the major conclusions. Section 3.0 provides the detailed cost analysis, including supporting statistical exhibits. Section 4.0 presents our benefits analysis and observations regarding the

[1] Statements of qualification of the senior study participants are contained in Appendix A.
[2] The sample of large corporate respondents included manufacturers and shippers of laptops, cell phones, power tools, radio/video equipment, and lithium ion batteries.

significant deficiencies in the benefits assumptions and analysis contained in the PHMSA study. In section 5.0, we combine the costs and benefits to show that the proposed rule cannot be justified by any reasonable assessment of the rule's economic impacts.

In short, the benefit-cost ratio shows that the proposed rule would produce less than one cent of benefits per dollar of cost. Due to the rule's short comment period, the CAC/TranSystems team did not have time to estimate the rule's negative impacts on the U.S. macro economy. If it had, those impacts would be included as "disbenefits," and the rule's true benefit-cost ratio would actually be negative.

2.0 Summary of Results

2.1 General Findings

As explained above, CAC and TranSystems were asked by PRBA to review the PHMSA's proposed rule regarding the transportation of lithium batteries in terms of the reasonableness of the methodology and results as described in the Hazardous Materials; Transportation of Lithium Batteries: Cost-Benefit Analysis/Regulatory Flexibility Analysis (December 2009), also referred as the "BCA". This analysis focuses on the benefits and costs estimated for the proposed rule in BCA, which the PHMSA used to support a determination of a positive benefit-cost relationship, and provides alternative estimates based on more detailed analysis and judgments that are based on real-world experience.

This report by CAC/TranSystems analyzes separately the PHMSA's benefit and cost estimates with regard to both the results produced and the methodologies and data used. In general, the PHMSA cost estimates are based on a highly simplified representation of complex trade and transportation markets involving products that use lithium ion cells and batteries. The very minor costs estimated by PHMSA totally ignore substantial disruptions to the supply chains of those products. Increased costs for packaging, transportation and other logistics services, in combination with delay-based inventory cost increases, will translate into higher product costs and lost sales.

Similarly, the benefit calculations are not based on a detailed analysis of actual losses incurred under the current rule, but rather are speculative projections of future losses based on a safety history that is totally unrelated to the proposed rule and on a blanket assumption that those losses will be completely avoided by the rule. Furthermore, the PHMSA also speculates on what the potential benefits might be if a catastrophic aircraft loss were to be averted without providing any evidentiary support for the notion that the rule would have anything to do with preventing the loss. In both cases, the benefits are not directly correlated with the rule and the PHMSA provides no causal basis for assuming the rule would have any benefits whatsoever.

With some very reasonable corrections to the PHMSA's inputs and methodology, the ultimate benefit-cost relationship changes dramatically. A summary of the CAC/TranSystems findings and conclusions is as follows:

- The PHMSA has not conducted a thorough and competent empirical analysis of either purported rule-related air safety benefits or the significant cost and time impacts on the commerce of cellular phones, notebooks, and other affected products.
- PHMSA's estimate that the cost of implementing the proposed rule would be $70.6 million is wrong. CAC/TranSystems estimates 10-year direct costs to shippers of $8.5 billion (both figures discounted to net present value terms at 7% per year).
- PHMSA's estimate that the benefits of the proposed rule would be $228.2 million over the next ten years is also wrong[1]. CAC/TranSystems estimates benefits of $1.4 million (net present value) in the next ten years.
- When PHMSA's errors are corrected, the benefits of the proposed rule are less than 0.1% of costs.

2.2 Summary of Benefits

The following general comments apply to the PHMSA's analysis of benefits that are forecast for the proposed rule:

- PHMSA's benefits estimates are based upon irrelevant and erroneously applied data that bear no relation to the real-world.
- The PHMSA has provided no historical evidence of any aircraft accidents or damage, or any personal injuries or deaths, due to the transportation by air of lithium ion batteries or products that contain them.
- Without any basis in historical fact or experience, PHMSA's benefits analysis assumes the savings of avoiding a catastrophic aircraft loss during the next 10

[1] This is PHMSA's estimate for saved damages plus the savings of one catastrophic airplane crash (see computation described in Table 5-1).

years. This method is in direct contradiction of standard FAA methodology for aviation safety benefits analysis.

The PHMSA's benefit calculations are not based on standard methodologies for comparing the level of aircraft damages and personal injuries or loss of life under two distinct scenarios – with and without the proposed rule. The standard FAA methodology is based on: (1) a detailed analysis of past damages associated with a clearly defined set of status quo conditions; (2) projecting those damages into a future time period based on reliable forecasts of activity growth, reasonable modifications to operating patterns, and consideration of mitigating factors that already exist (or would exist) and would lessen expected damages; and (3) a well-supported analysis of the marginal change in expected damages under the proposed rule.

The PHMSA provides none of these required elements in its analysis. Future damages associated with the proposed rule on lithium ion battery transportation are based on: (1) past incidents that may or may not be related to lithium ion batteries and may or may not be affected by the rule; and (2) a combination of broad assumptions that ultimately ignore the lack of measurable damages that can in any way be linked to lithium ion battery transportation with or without the rule.

The PHMSA benefit calculations are presented under two scenarios. The first is that there will be some future continuation of battery-related "incidents". But rather than projecting limited damages similar to those that actually happened in the past (see Exhibit 4-6), the PHMSA estimates that future incidents would result in large damages based on a whole range of prior, unrelated fires, including the catastrophic ValuJet accident in 1996. That accident was caused by oxygen canisters – not batteries – and its inclusion in PHMSA's analysis greatly skews the expected damage levels. As a further point of error, the PHMSA then assumes that these future damages would be completely eliminated by the rule, despite the fact that many of the incidents utilized by the PHMSA to project damages are not covered by the rule (e.g., fires related to passenger cabin items). It is clear to CAC/TranSystems that the benefit estimates were inflated by the PHMSA to just barely exceed the very understated and incomplete costs that were separately calculated.

The second PHMSA scenario is based entirely on speculation that there could be a fire caused by lithium ion batteries which could cause a catastrophic accident, and that the rule would definitely prevent the fire from happening. There is no technical analysis of historical patterns that suggests any probability this type of accident will result in the absence of the proposed rule, nor is there supporting evidence of how, or if, this proposed rule would change those damages (or the underlying probability of it happening).

CAC/TranSystems reviewed the benefits methodology and made some reasonable and conservative adjustments resulting in the following:

- To estimate future benefits, CAC/TranSystems conservatively assumed 1.54 lithium ion fire incidents would occur in the next 10 years (or 0.154 incidents per year) based on the actual historical rate of incidents. Since fires involving lithium batteries in recent history (based on the PHMSA's own source data) averaged $6,200 in damages, the next 10 years of relevant lithium ion incidents would cost approximately $10,000, or an average cost of $1,000 per year (Exhibit 4-2). **This is 99.9% less than the $10.0 million annual benefit claimed by PHMSA (Exhibit 4-3)**.
- Using corrected data, realistic estimates, and probabilities of occurrences, CAC/TranSystems' single point estimate of the loss from the entirely speculative catastrophic aircraft accident is $1.4 million, not $135.0 to $868.8 million as projected by the PHMSA. This is the maximum benefit that could be ascribed to the proposed new rule, and this assumes that the probability of accident prevention due to the rule is 100%. This latter assumption is, itself, not plausible.

2.3 Summary of Cost Impacts

The following observations and conclusions apply to the PHMSA cost estimates:

- The proposed rule will significantly affect all aspects of the highly sophisticated logistics systems for electronic products, leading to higher costs and slower delivery for U.S. consumers. PHMSA failed to research or understand the broad upheaval in global supply chains and distribution methods that would be caused by the rule.

- PHMSA's costs are incomplete, based on simple assumptions and, in some cases, calculated erroneously. Its simplified analysis ignores distinctions between vastly different products and manufacturers' supply chains and greatly underestimates costs by shifting products into large consolidated shipments that would not occur.
- PHMSA wrongly assumes that there will be no growth in affected trade flows and associated cost impacts over the next ten years, despite acknowledging that sales of lithium ion cells and batteries increased 13% per year from 1998 to 2008. Thus, PHMSA's estimated costs are artificially low.
- If two simple corrections are made to PHMSA's analysis (and using the same methodology), the 10-year costs nearly triple from $70.6 million to $191.8 million.
- A fundamental failure of the analysis is that PHMSA underestimated the volume of products that would be directly affected by 92% (16.7 million units vs. 204 million units) and ignored the cumulative effect on shipments using multi-flight itineraries.
- PHMSA did not consider the effect on foreign-to-foreign trade flows, either directly or via the U.S. But U.S. airlines such as FedEx and UPS are highly dependent on these markets and their operations would be similarly affected.
- PHMSA ignored all rule-related costs for higher cost hazmat handling by airlines and other logistics service providers, and for increased inventory costs due to transport delays.
- Use of publicly available foreign trade statistics and industry-specific distribution patterns increases PHMSA's estimated annual costs from $9.4 million to over $1.1 billion.
- PHMSA failed to consider that U.S. distribution centers may very well be relocated to Mexico and/or Canada if the rule is implemented as proposed, with a loss of U.S. jobs, payroll and revenues.

Table 2-1 compares the costs as corrected and developed by CAC/TranSystems with the PHMSA estimates.

Table 2-1
Comparison of Annual Cost Impacts
(in Millions)

Cost Element	PHMSA	Corrected PHMSA	CAC/ TranSystems
Packaging	$8.67	$22.92	$182.43
Training	$0.67	$2.55	$4.74
Transport and Related Services	$0.05	$0.05	$338.58
Logistics	$0.00	$0.00	$377.80
U.S. Trade Sub-total	$9.39	$25.52	$903.55
International Trade Impacts on U.S. Companies	$0.00	$0.00	$223.53
Total Impacts	$9.39	$25.52	$1,127.08

Source: Exhibit 3-11

2.4 Comparison of Benefit-Cost Ratios

As shown in Table 2-2, the PHMSA estimated a 3.23 benefit-cost ratio (3.23 dollars of benefit for every dollar of cost). This ratio greatly exceeds the adjusted ratio calculated by CAC/TranSystems, which is based on more realistic estimates of reductions in affected damages and the associated costs with the rule's implementation. Reasonable adjustments to either the proposed benefits or the proposed costs results in ratios below the 1.0 threshold. Combining the benefit corrections with the cost corrections demonstrates that the proposed rule produces less than one cent of benefits for every dollar it imposes in costs.

Table 2-2
Comparison of Benefit-Cost Ratios

	Summary of Benefits and Costs (NPV) /1 (In Thousands of Dollars)		
	PHMSA	PHMSA Corrected	CAC/ TranSystems
A. BENEFITS			
- Without Catastrophic Aircraft Loss	$75,150	$7	$7
- With Catastrophic Aircraft Loss	$228,207 /2	$1,407	$1,407
B. COSTS	$70,560	$191,800	$8,470,240
C. BENEFIT-COST RATIOS			
- Without Catastrophic Aircraft Loss	1.07 to 1.00	< 0.001 to 1.00	< 0.001 to 1.00
- With Catastrophic Aircraft Loss	3.23 to 1.00	0.01 to 1.00	< 0.001 to 1.00

1/ Based on a 7% discount rate
2/ Weighted average of cargo aircraft and passenger aircraft in a a ratio of 16:1 (see Section 5.0, Table 5-1).

Source: Exhibit 5-2

3.0 The PHMSA Greatly Understates The Cost Impacts on U.S. Electronics Manufacturers, Distributors and Consumers

The PHMSA analysis estimates minor costs for packaging, training and product/shipment documentation as a result of the proposed rule, but these costs are not calculated correctly and, more importantly, ignore substantially greater cost impacts that would apply throughout the logistics systems for key consumer products. This section reviews the PHMSA estimates and modifies them to correct for errors and inconsistencies, and also provides a detailed analysis of costs that should have been included and estimates of the likely impact levels.

3.1 The PHMSA's Cost Estimates To Industry and the U.S. Economy Exclude Significant Costs, Ignore Impacts on Supply Chains and Understate Even the Limited Impacts That Were Addressed

The PHMSA estimates of the proposed rule's cost impacts are based on very broad assumptions concerning affected volumes and unit cost factors for packaging, training and documentation, most of which are not well-sourced or explained. In total, these costs are an insignificant portion of the true cost impact of the proposed rule. As described below, the PHMSA analysis ignores significant impacts on air cargo industry operations, costs and efficiency, as well as enormous disruptions to the supply chains of leading U.S. manufacturers and consumer product retailers. When these impacts are combined, it will significantly undermine the ability of U.S. consumers to buy these products in a timely manner and at reasonable prices.

The limited cost impacts identified in the PHMSA analysis are not based on any analysis of the extremely complex distribution systems for the products affected, but rather apply minor packaging and labor costs for a uniform "battery" product. PHMSA's cost analysis was not based on an appropriate industry analysis of logistics costs and supply chain systems as they operate today, and as they would operate after being redesigned if this rule takes effect. The following sections describe specific assumptions that affect the results.

3.1.1 The Volumes of Affected Units Are Not Sourced or Empirically Derived And the PHMSA Erroneously Treats Batteries As A Single Uniform Product

The following assumptions were used by the PHMSA in estimating the annual volume of battery-related traffic that would be affected by the rule (see Exhibit 3-1):

- The affected volume estimate is based on the transportation of "cells and batteries" initially, but later limited to "cells" weighing an average of 1.6 ounces. It is assumed that these cells move in consolidated packages (ranging from 24 to 250 cells per "package") with the package size entirely determined by unit package costs.
- The PHMSA affected volume estimate identifies a total of 400 million "small lithium cells" transported aboard aircraft in 2008 from a universe of 3.3 billion cells moving by all modes worldwide. This subset is calculated based on the following assumptions:
    - The "lithium ion" share of worldwide battery cell transportation (assumed at 80%) is not sourced and is a limitation that is not clearly delineated throughout the analysis. This limitation also conflicts with the benefit analysis (that included "incidents" associated with "lithium metal" batteries as well).
    - The "cellphone/notebook" share of lithium ion battery cell transportation (assumed at 75%) is also un-sourced; nor does PHMSA indicate why other products should be excluded.
    - The "air share" assumption of 20% for "lithium batteries" is not sourced and does not appear to be specific to lithium ion batteries, or to lithium ion batteries in notebooks or cellphones, as is implied. Lithium ion-powered products, when compared to lithium metal products, tend to be higher valued and have a shorter product cycle time – all characteristics that result in higher use of air transportation. U.S. trade data for 2009 indicated that 67% of imported cellphones, 81% of imported notebooks and 69% of imported lithium ion cells and battery packs moved via air

(see Section 3.2.1). The CAC/TranSystems survey of PRBA members indicated that these estimated shares were reasonable and possibly understated.

- In the packaging cost impact analysis (Section 2.2 of Cost-Benefit Analysis), the PHMSA makes a further estimate of the number of units requiring new packaging, although the analysis appears to assume that all of the cells are shipped independently of products that contain them and that the amount of cells that are shipped in a single package could be varied solely based on minimizing the unit cost of packaging (see below for analysis of these cost impacts). It is unclear whether the distinction between "inner" and "outer" packaging is intended for products where the battery packs (rather than the separate cells) are contained in separate packages that are then packed in larger packages containing the primary products. As the increase in packaging costs only applies to "outer" packaging, the number of packages should have been based on the number of packages containing a lithium ion battery or electronic product. Under status quo conditions, the PHMSA assumed that the average "package" affected by the rule would contain 24 cells, resulting in a total of 16.67 million packages.[1]

The most glaring problem with these assumptions is the Agency's final estimate of 16.67 million shipments that would require new packaging. U.S. foreign trade statistics (see Exhibit 3-3) indicate that a total of 324 million cellphones (and similar products), 47 million notebooks, over 400 million other products that also use lithium ion batteries, and 68 million units of lithium ion batteries were imported into the U.S. in 2009. Including exports and re-exports of these products, a total of 989 million units were shipped to or from the U.S. in 2009, of which 471 million were shipped by air (48% of total). CAC/TranSystems estimates that 52% of those units would be affected by the rule for a total 214 million units. In comparison, the PHMSA understates the number of products with packaging and other cost impacts by 92%.

[1] Section 2.2 below addresses the issue of how lithium ion cells associated with a single product can be reconfigured for shipping purposes.

A key criticism of the PHMSA methodology is that all products and battery packs are treated as a single uniform product, "small lithium cells", rather than as a varied mix of unique products and replacement/supplemental battery packs that contain those cells. Each of these product flows have distinct patterns for the use of air transportation, the design of production/distribution systems (particularly in regard to where the battery source is combined with the final product), and the potential impacts on "upstream" suppliers (particularly battery pack manufacturers) and "downstream" wholesale, retail and distribution sectors. In particular, PHMSA's use of a single uniform box to handle thousands of unique products and shipment flows (in the packaging cost impact analysis) indicates a lack of understanding of the affected trade flows.

PHMSA also assumes that a "small lithium cell" (or product containing it) will be shipped by air only once during product distribution. In reality, an affected product delivered to a final user may experience multiple air movements as part of a multi-modal journey, often under the control of different parties (e.g., manufacturing, third-party distribution company, and retailer). While the PHMSA has not assigned any cost or time impacts related to transportation, the extra costs and processing times that would occur with the proposed rule would be cumulative to the cost and delivery of the final product that the consumer receives. Similarly, the assumption of a one-time packaging upgrade ignores the probability that products would require re-packaging throughout the distribution chain, again with the costs being cumulative for the final delivered product.

Finally, the PHMSA made no estimate of future growth in affected trade flows and associated cost impacts despite acknowledging that secondary lithium battery sales increased 13% per year from 1998 to 2008 (BCA, Table 1-5).

3.1.2 Packaging Cost Impacts

PHMSA based its packaging cost impacts on assumptions concerning the number of affected packages (as determined by unit package size), the increased cost for compatible packaging and the mix of package types under the proposed rule. Specifically, the estimates for packaging costs are based on the following assumptions:

- Under the current regulation, the packaging costs for existing shipments[2] are based on the following assumptions:
  - There are 400 million cells transported annually with an average of 24 cells per outer package; resulting in 16.67 million affected packages.
  - A unit cost of $0.50 per outer package for a total of $8.33 million of packaging costs.
  - A unit cost of $0.012 per inner package for 400 million affected cells for a total of $4.8 million.
  - Total Packaging Costs = $13.135 million per year
- Packaging costs for the same level of air trade under the proposed regulation are estimated based on significant changes to both the package size and the unit package cost. The costs are estimated for two scenarios ("low-cost" and "high-cost") with the expected cost estimated as the midpoint between the two. The following assumptions applied:
  - Under the "low-cost" option, outer packages (uniformly sized at 14" x 6 7/8" x 7¾") are assumed to average 250 units requiring 1.6 million packages (down from 16.7 million under status quo conditions) which at a unit cost of $1.75 equals a total cost of $2.8 million. The unit cost for the inner package is the same as assumed for the status quo ($0.012 per unit) for a total cost of $4.8 million with no change in the number of units.
  - Under the "high-cost" option, the average cells per outer package are 200 (requiring just 2 million packages) which at a unit cost of $2.00 yield a

[2] The PHMSA identified the status quo costs as applying to "excepted" shipments, but otherwise applies the packaging assumptions to all shipments. The distinction between "excepted" and "non-excepted" is based on whether a shipment contains "24 or less cells" or "24 or more cells", although this definition does not match the existing regulation's definition of excepted shipments. The analysis also contains an estimate that assumes all shipments are moved on the PHMSA's definition of a "non-excepted", but it is unclear what the purpose of these "non-excepted" calculations are as there is no indication of what share of current trade is moving as either excepted or non-excepted by their definitions. Rather, the PHMSA calculates the packaging cost assuming all of the trade moves in one or the other form and then only uses the "excepted" estimate for comparison purposes.

total cost of $4.8 million. The unit cost for the inner package is assumed at $0.08 per unit for a total cost of $32.0 million.

- The average cost of the two options under the proposed regulation was $21.8 million which was compared to the "status quo" (i.e., under current rule) cost of $13.13 million for **a net cost impact of $8.7 million**.

The following are major faults and fatal flaws of this methodology and its underlying assumptions:

- As described above, the PHMSA's packaging cost impacts combine the cost of "inner" and "outer" packaging for "lithium ion battery cells", but the PHMSA does not provide an explanation of how this assumption applies to actual shipping patterns for the various products involved. There also is no explanation as to the purpose of either type of packaging (i.e., for air transport only or for final product delivery). The calculations should be based on an accurate estimate of actual packaging costs with and without the rule rather than theoretical scenarios that do not reflect reality.
- The primary effect of the proposed rule would seem to be that all lithium ion cells (in whatever form) would require upgraded packaging for purported safety reasons, presumably increasing the unit and total cost for both the "inner" and "outer" packaging. However, PHMSA's final cost estimates combine (1) a <u>net decline</u> in total outer packaging costs despite a $1.25 to $1.50 increase in unit costs; and (2) a <u>net increase</u> in total inner packaging costs despite an assumption of no change in those unit costs <u>or the number of packages required</u>.
- The current unit cost of $0.012 for <u>inner packaging</u> provides "adequate short circuit protection" and is deemed adequate to satisfy the requirements of the proposed rule's "low-cost" scenario, although shipments under the "high-cost" scenario are assigned a unit cost of $0.08 because they require "greater integrity". By using the "arithmetic" mean of the "low-cost" and "high-cost" scenarios, the PHMSA is implying that 50% of the shipments under the <u>proposed rule</u> will use bags of "greater integrity" that meet the drop test standard contained in <u>the current</u>

rule, but that 50% will not.[3] The $0.012 inner packaging either meets the proposed rule's standards or does not, and the correct calculation should have been based on upgrading from the lower to higher inner package cost for all shipments. Alternatively, the "low-cost" inner packaging should be based on a reasonable alternative to what is currently used for shipments that do not meet the drop test standard (which the PHMSA does not provide), but both the "low-cost" or "high-cost" alternative should fully satisfy the requirements of the proposed rule (including those beyond the drop test standard), and clearly they do not.

- The estimated cost impact for inner packaging due to the rule is $13.4 million ($18.2 – $4.8 million). This impact is based entirely on a shift of 50% of the shipped units to packaging meeting the current drop test standard. A more reasonable estimate is $27.2 million ($32.0 - $4.8), based on all of the shipments meeting the drop test standard.
- The cost impact for the more critical "outer packaging" (in terms of the purported safety objectives) is negative. This estimate is simply incredible and it is the type of failure in PHMSA's analysis that undermines the integrity and credibility of its entire analysis. This is based on a fundamental misconception that the "lithium ion cells" are a commodity for which package capacity and size can be varied independently of which product they are contained in. The unit cost under the current rule is estimated at $0.50 for an outer package that averages 24 "cells" per package for a total annual cost of $8.335 million. Presumably, this implies that packaged products containing or shipped with a lithium ion battery average 24 cells per unit (despite the wide range of variance across different products). Instead, the "24 cells" value for the status quo estimate is supported solely by an assumption that shippers will maximize the cells per package, rather than a reasonable consideration of the true unit size for the notebooks and cellphones that are being considered. The "status quo" scenario is therefore not a reasonable representation of current costs as standard benefit-cost analysis requires.

[3] In reality, all shipments would have to meet the higher standard for transport that would increase packaging costs for all shipments.

- The PHMSA then estimates that the additional (or different) materials required to meet the proposed rule's standards would add \$1.25-\$1.50 per outer package, but incredibly assumes the unit size of shipments would increase by a factor of 8.3 to 10.4. The PHMSA estimate bases the net cost change on a single uniform box that appears to have been selected solely based on its ability to handle more "battery cells" without regard to whether its dimensions and capacity are representative of what is currently used and, more importantly, whether it would likely fit shipper needs in the future.
- The implication is that notebooks and cellphones could, and would, be packaged in groups of 8 to 10 for air transportation but still be purchased in units of one. This would require a complete transformation of current distribution systems to include separate transportation and final product packaging, and extensive re-packaging within the U.S.[4]
- The result of this assumption of greater consolidation for shipments is a reduction of outer packaging costs from \$8.335 million under the current rule, to \$3.4 million[5] under the proposed rule, or <u>savings of nearly \$5 million</u> based entirely on a theoretical maximum package size rather than actual packaging requirements.[6]

A more accurate representation of packaging cost impacts should have been based on the following:

- It is unreasonable to assume any change to distribution of package sizes that are currently in use. It is comparable to assuming that a charge applied to passenger air transportation on a per flight basis could be minimized by assuming a aircraft size that increases by a factor of 8 to 10. The total number of packages that

[4] As is described in Section 3, such a system would require full knowledge of when a particular product will no longer move by air. Typical flow patterns that combine air transport by manufacturers of products to the U.S., onward ground transportation to retailers, and <u>possible</u> air transport to final residential or business consumer would require substantial re-packaging operations or else elimination of customer delivery options.

[5] The average of \$2.8 million for the low-cost scenario and \$4.0 million for the high-cost scenario.

[6] The absurdity of the underlying assumptions is demonstrated by the outer packaging estimates for non-excepted shipments under the current rule. Although not used in the calculations, the PHMSA assumes the exact same unit cost for the outer package (\$0.50), but assumes a package with 733% more capacity. It is clear that the unit cost estimates are not based on real world package types.

require upgraded materials should represent the true requirements for product delivery and trade patterns (most importantly the unit size for final delivery) and should be the same under all scenarios (even as underestimated by the PHMSA).

- The unit cost under the proposed rule should be based on modifications required for the same mix of package configurations as are currently used in the companies' logistics systems.

Based solely on the estimated increase in packaging unit costs of $1.25-$1.50 and using the PHMSA's low estimate of affected packages of 16.67 million, the packaging costs with the rule would be $29.2 to $33.3 million for an average net impact of $22.9 million – nearly triple the PHMSA estimate. Applying the same unit cost increase to a more realistic estimate of the number of affected packages moving by air in U.S. foreign trade (204 million), the net impact would be $281 million[7].

3.1.3 Training Cost Impacts

The PHMSA's estimates of training costs are based on assumptions concerning the number of personnel requiring training and the cost of hazardous materials training. The cost estimates are based on the following:

- A total of 22,174 employees at an average wage of $21.17 per hour are assumed to require training. The source of this estimate is a 2000 study, but there is no explanation as to the industries or type of personnel that are included, much less why an out-of-date source was used without at least inflating the cost factors to 2009 levels. The PHMSA data source should have been supplied with the analysis.
- The annual training required for each employee is estimated assuming an average of 27 employees per 5-hour training class with one instructor per class at $50 per hour (or $250 per class).
- Annual training costs are estimated based on the annual number of classes and the average cost per class in terms of instructor and trainee labor costs. The total annual

[7] $22.9 million x (214/16.7) = $294 million

cost is estimated at $674,700 (although this PHMSA estimate includes an error in calculation as shown below).

As shown in Exhibit 3-1, the calculated estimate for trainee labor costs is based on just one hour of trainee time per class rather than the stated assumption of five hours per class.[8] Correctly applying the formula shown on page 12 of the BCA would result in a total impact of $2.55 million – nearly four times the PHMSA estimate of $0.67 million.

The other flaw in this estimate for training cost impacts is the lack of explanation for the number of affected personnel that would require training, and whether the estimate includes all of the individuals that could potentially handle or package an affected product. The total number is low considering that these products are typically transferred between multiple units within the manufacturers' supply chains, both in the U.S. and overseas, as well as by upstream suppliers and downstream intermediaries (wholesalers and retailers). According to the U.S. Bureau of Labor Statistics (BLS), there were over 60,000 employees involved in transportation or material moving for manufacturers of affected products in 2008 (Exhibit 3-2). While all of these employees would not be handling affected products (although most would need to be trained and able to handle the full range of products), this total does not include the overseas employees at source plants and distribution centers that do most of the packaging.

In addition, the wholesale and retail industries that handle these products include another 275,000 employees, according to the BLS data. Most of these industries do not currently handle hazardous materials, so the impact could be significant. The BLS statistics show further that the transportation support (e.g., freight forwarders) and warehousing sectors include another 492,000 employees, many of whom may not currently handle these products. The training impact is likely to extend well beyond the PHMSA's estimate of 22,000 workers.

[8] There are no appendices showing how calculations were made, but this correction is the only one that matches that annual estimate of $674,700.

Employees in Transportation and Material Moving Occupations (2008)

Affected Manufacturers	60,590
Wholesale and Retail	275,540
Transportation and Warehousing	492,350
Total	828,480

Source: Exhibit 3-2

3.1.4 Cost Impacts for Information Collection

The PHMSA estimates include minor cost impacts for "information collection" that are limited to design documentation and package documentation. The annual costs are based on the following assumptions:

- Design documentation costs assume each lithium battery manufacturer has an average of 10 designs, each of which requires a half-hour of labor at $25 per hour. Total costs are estimated at $13,750.
- Package documentation costs assume an average of 100 packages per shipment and 30 seconds of extra labor time at $25 per hour for a total of $34,729.

The estimates for both types of costs suffer from the same fatal problem as the other cost estimates. They are devoid of any documentation or credible support for the assumptions. In particular, the package documentation assumptions for average shipment size and extra processing time are based on no source evidence at all. While many of these products (including battery packs) move in consolidated form, the large shippers surveyed by CAC/TranSystems indicated that a high percentage of electronic product shipments moving by air are in single units to or from final users, particularly within the U.S. These single unit shipments would incur the same documentation costs as the large consolidated shipments, a reality which the use of a "maximum" shipment size ignores. Similarly, the assumption of 30 seconds of additional shipment time in the documentation cost estimates is not based on any research or source data.

In the end, the PHMSA has estimated a total of $50,000 of increased documentation costs to handle the import and domestic transport of nearly 17 million shipments – an estimate that is far too low considering the enormous disruptions to the supply chains and consequential added costs for these products (see Section 3.3 for a full analysis of expected cost impacts as identified by the shipper community).

3.1.5 Net Present Value of Projected Cost Impacts

The PHMSA estimates 10-year cost impacts discounted to the current year at either a 3% or 7% discount rate. The combined annual costs for packaging, training and information collection is estimated at $9.39 million which equates to $70.6 million at a 7% discount rate and $82.5 million at a 3% discount rate. Despite including an implicit escalation in the benefit calculations, there is no comparable growth in costs.

Correcting the training calculations and making reasonable assumptions for packaging impacts (as described above) increases these cost impacts significantly without any adjustments to the universe of affected products or the inclusion of major costs that were ignored by the PHMSA. Simply correcting PHMSA's packaging and training cost increases the annual cost impacts to $25.5 million, which equates to a 10-year NPV impact of $191.8 to $224.2 million, both of which far exceed PHMSA's estimated projected benefits for the proposed rule.

3.2 The PHMSA Has Ignored the Full Scope of Cost Impacts in Terms of Trade Flows, Trading Parties and Affected Activities

The PHMSA considered a very limited number of direct cost impacts that were assigned to an oversimplified flow of generic lithium ion cells and batteries. Accordingly, its total cost estimates were extremely low, particularly considering the size and scope of the consumer product industries seriously impacted. This section provides a more complete and detailed description of the trade flows that are affected and the industries and other parties that will experience those cost impacts. The types of impacts that should have been measured will also be described and estimated fully including the complete impact on the supply and distribution chains for these key consumer products. Finally, an alternative estimate of 10-year cost impacts is determined and presented for comparison to PHMSA's estimate.

3.2.1 True Scope of The Rule Impacts

The PHMSA's very simple description of the affected trade flows as "lithium ion cells and batteries shipped by air for use in notebooks and cellphones" ignores the full scope and complexity of the worldwide distribution and supply chains that would be significantly disrupted by this rule. There are a number of commodities other than notebooks and cellphones that would be affected as well, and there is substantial diversity even within those two product categories that requires consideration and assessment. While the PHMSA is vague as to the specific products and trade flows that are considered in its cost estimates, it is clear that the full range of impacts on U.S. imports alone are understated, not to mention the impacts on U.S. domestic re-distribution, re-exports and foreign-to-foreign trade. Finally, the PHMSA impacts appear to be limited to battery manufacturers and ignore major impacts throughout the supply chain from consumer product manufacturers to final consumers, including all intermediary parties.

The proposed rule would directly affect all lithium ion batteries (except for batteries with a Watt-hour rating of not more than 3.7 Wh that are packed with or contained in equipment) transported on U.S.-registered aircraft. The affected commodities would fall into the following general categories:

- Cells transported for assembly into battery packs
- Battery packs
- Consumer products shipped with a battery pack separately packed
- Consumer products shipped with the battery pack assembled within
- Consumer products shipped with an integrated battery (i.e., non-removable)

- Used batteries shipped with or without a consumer product for the purpose of recycling, repair, or return

These category distinctions are important in that each presents a different level of safety risk, but no distinction is presented in the PHMSA analysis. In addition, affected consumer products may move in different forms based on the production/distribution systems for specific product types or manufacturers, and may fit into multiple categories for a final product. Each manufacturer determines the optimal methods for final product production and distribution, and the proposed rule could have a significant effect on these essential decisions.

Commodity Types

The types of commodities or products that would be affected by the rule include the following[9]:

- **Battery Cells** – While the volume of lithium ion cells that are flown into the U.S. is limited, a significant amount are flown between foreign points overseas and may utilize U.S.-registered aircraft of U.S. express carriers (FedEx and UPS) with hubs in Asia, Europe and the U.S., and other airlines. The cells that are flown into the U.S. are primarily for specialty battery production and, while not significant in volumes, are critical to U.S. competitiveness in medical, military and other emerging technologies (e.g., electric cars).
- **Battery Packs** – Cells are typically assembled overseas into battery packs that are then either "married" or "kitted" with a final consumer product (in a separate pack or installed) and shipped; or they are shipped separately and matched with the final product in the U.S., sometimes at an intermediate point. Battery packs are also produced for sale as extra or replacement power sources, often shipped directly to final users from overseas. The majority of these products imported into the U.S. move by air.

[9] These products/commodities were identified by the CAC/TranSystems survey of key shippers (PRBA members) which identified products by harmonized schedule commodity code that may use lithium ion batteries.

- **Notebook and Handheld Computers** – The majority of these are produced overseas and mostly flown to the U.S. with a battery pack installed or separately packed, although some products have an integrated battery due to size and weight considerations. Some products are transported directly to end users as individual units with the remainder shipped in larger consolidated shipments to a manufacturer's U.S. distribution center, or directly to wholesale/retail companies. A similar process occurs within the U.S. with some products shipped from distribution centers as units directly to end users or as larger consolidated shipments to "downstream" parties (e.g., retailers).
- **Cellphones and Other Telecommunications Devices** – Cellphones and similar products move in distribution patterns and forms similar to that of small computers, although in smaller unit sizes and larger volumes.
- **Audio/Video and Other Home Entertainment Products** – This category includes MP3 players and handheld video devices, as well as cameras and video recorders. The distribution patterns and forms are similar to the other consumer electronic products.
- **Hand Power Tools** – Battery-powered hand tools, because of their size and relatively low unit value, are more likely to be shipped from overseas without a battery and married with a battery source in the U.S. for final distribution.
- **Other Consumer Products** – This category includes products such as personal care devices and specialized instruments. While following similar patterns as other consumer goods, these products tend to move in smaller volumes and frequently are more highly dependent on air transportation.
- **U.S.-Produced High Technology Items** – While the production of more mature consumer products is concentrated overseas (mostly in Asia), a significant share of high tech product development and testing is done in the U.S., particularly for military applications and products with highly secretive technology. Those products that are powered by batteries are dependent on fast and reliable delivery of cells or finished batteries from overseas sources. A disruption in these supply chains could have a significant impact on U.S. competitiveness for these types of products, as well as negatively affecting the development of proprietary military

technology. There is currently a substantial level of development work on hybrid and electric vehicles, much of which includes exploring the use of lithium ion technology. Increased cost and transit time for products to support these activities would not only hamper development efforts, but could limit the use of lithium ion batteries as a fuel alternative.

It is important to reiterate that these categories of products contain a wide range of items supported by unique distribution systems tailored to varying market demand requirements. A common characteristic is the use of lithium ion (and similar) battery power in order to create smaller, longer-lasting and more energy efficient products, and any hindrance to the use of that technology will affect the benefits achieved by the ultimate home and business users, as well as the cost to the end-user. The high growth in applications for lithium ion batteries has tracked closely with innovations to make electronic products smaller, lighter and longer-lived in terms of battery power. This rule could significantly impede continued development in this area, and it would seriously impact final demand and sales by U.S. companies.

Similarly, most of the affected products are high valued and have short product cycles times, and therefore are highly dependent on fast reliable worldwide air distribution networks to satisfy market demand. Overnight guaranteed product delivery has become an essential service element in high quality electronic product markets. The burdens that this rule will place on those networks will drastically affect the final users, as well as the competitiveness of U.S. multi-national corporations.

Affected Trade Flows

As described above, the proposed rule would affect the packaging, handling and transport of lithium ion batteries (in whatever form) on U.S. international or domestic flights by U.S. and foreign airlines, as well as traffic handled on U.S.-registered aircraft between two foreign points regardless of the nationality of the operating carrier. The categories of affected trade flows therefore include:

- **U.S. Imports** – The primary trade flows that would be affected are the high volume imports of battery-powered consumer products and supporting batteries from overseas, especially Asia. The rule would apply to both U.S. and foreign airlines, all-cargo and passenger/combination carriers.
- **U.S. Domestic Air** – The domestic distribution of the imported products is also heavily dependent on air transportation, both from the importing manufacturers and distributors, and by any "downstream" wholesale or retail entities. The majority of U.S. domestic air transport is now handled by the express airlines (FedEx, UPS and, to a lesser extent, DHL) which also provide surface transport options within the U.S. and to Canada and Mexico. Other markets that would be seriously affected are offshore markets (Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands) and smaller markets that are served with aircraft not capable of handling these products under the proposed rule (see below).
- **U.S. Exports and Re-Exports** – While not as significant as imports, there are some affected products that are produced in the U.S. and shipped overseas. These products would face the same impediments as imported products. More significantly, products that are produced overseas and transshipped via a U.S. point would be affected on both the inbound and outbound flights, and at the point of U.S. handling. Long flight distances and limited cargo capacity between Asia and Latin America results in a large flow of products being shipped (consolidated with U.S.-destined products) to a U.S. distribution center and then re-exported by air to Latin America. This rule would significantly inhibit these flows or remove the distribution activities entirely from the U.S., both of which have direct economic consequences.
- **Foreign-to-Foreign Air Shipments** – The rule would also cover transportation on U.S. registered aircraft between two foreign points including (1) express carrier flights in support of worldwide networks; (2) a limited number of flights by U.S. airlines with fifth and sixth freedom rights; and (3) flights operated under ACMI contracts for foreign airlines by U.S. carriers. The first category is the most significant as both FedEx and UPS offer express and general freight services between more than 200 foreign countries usually using their own aircraft, but also using third-party carriers. Both airlines have large shares of the intra-Asia, Asia-Europe and Asia-Latin America trade markets and they handle most of the same products as those imported to the U.S. America's two

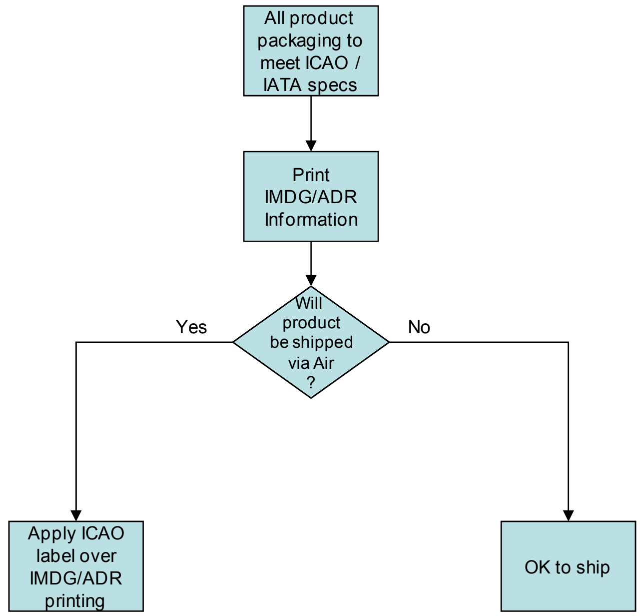
major express airlines have developed major hubs in Asia, Europe and the U.S. to create their efficient worldwide transportation networks.

- **Surface Trade** – While the rule does not propose significant changes to regulations that cover trade by ocean, truck, or rail, the highly sophisticated multimodal networks that handle distribution of affected products could experience costly secondary effects due to changes to air networks. It is likely that whatever higher level of packaging and documentation (and associated costs) are required for air shipments will be applied to all shipments to maintain consistency and flexibility. To give just one example, a manufacturer may tender a consolidated shipment of products for a U.S. national retail customer that includes some points that must be served by air and other closer destinations that can be served by truck. The final delivery point would have to be known at the time of packaging to discriminate between air and other shipments. Figure 3-1 displays added complexity that the rule will add to existing supply chain processes.

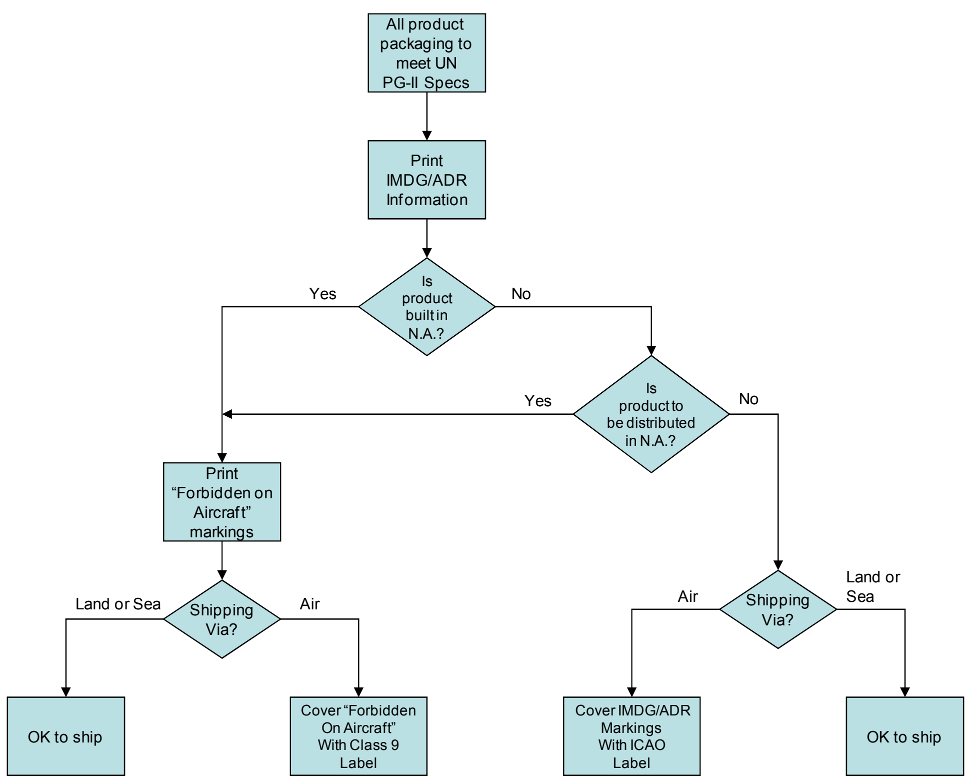
To complicate matters further, most product fulfillment systems are automated and respond to daily sales data that influence the routing to the final destination for products. Products designated for ground transport might need to be expedited by air to meet demand and, similarly, products packaged for Class 9 air transportation might need to be shifted to a higher demand surface destination. Multimodal distribution systems would need to be significantly reconfigured to either accommodate re-packaging or increased inventories for products packaged for mode-specific market segments (air or ground). Each would result in direct costs as well as a loss in flexibility that is an essential element of efficient consumer product supply chains. The problem would become even more intractable for supply chains that integrate multiple parties in the routing and packaging decisions.

Figure 3-1 Illustration of the Effect of Proposed Rule on Supply Chains

A. STATUS QUO



B. WITH PROPOSED RULE



Source: PRBA survey respondent.

The key point to understand is that individual products sold to U.S consumers are supported by worldwide multimodal distribution networks that include multiple participants that vary by market and by product category. The direct effect of the rule on some air-related elements of those networks would affect other air and surface elements as well.

Affected Parties

Another key point to consider in any cost-benefit analysis is that the production and distribution systems used to deliver a battery-powered product to a U.S. consumer involves a number of entities, some of which are directly affected by the rule with others experiencing secondary effects. The categories of affected parties include:

- **Manufacturers** – The most prominent group affected by the rule are the major consumer product manufacturers that are responsible for packaging and transport of the batteries from the point of production to the final user or intermediate transfer party. Most of the major manufacturers are large multinational corporations headquartered in the U.S. and Asia. U.S. companies lead the world in product innovation and part of their competitive advantage is based on the ability to quickly develop, produce and deliver new products that satisfy shifting consumer demand worldwide. In addition to the direct effects the rule would have on product distribution costs and delivery time, the rule would also lessen this advantage in world markets.
- **"Upstream" Suppliers of Components and Products to Final Label Manufacturers** – While some products are internally produced by a single manufacturer, many products depend on overseas producers of components and finished products. The key point of this distinction is that there would be foreign companies that will be affected by the rule, in particular requiring training in handling battery cells, packs and related products. U.S. manufacturers may lose access to key suppliers that are unwilling or unable to meet the training requirements (not to mention the problems with enforcement and certification in foreign countries).

- **"Downstream" Distribution and Wholesale/Retail Parties** – Similarly, while some products are shipped directly from a manufacturer to final user, many products move through one or more intermediate stages between producer and final user. These parties would be affected by the rule to the extent that air transportation is used (with secondary effects on entire networks similar to that of the manufacturers). An example of the complications is that the manufacturer could fly an affected product to its U.S. distribution center and truck a consolidated load to a U.S. retailer's distribution center where individual products are sent by air or surface within the U.S. or to Canada or Mexico, or overseas.
- **Air Cargo Airlines** – The affected consumer products move on international and domestic flights by a variety of airline types including express (integrated) air carriers, passenger airlines and general cargo airlines. The PHMSA report contains no analysis about the proposed rule's impacts on the costs and efficiency of airlines that carry the affected products, and it provides no assessment of the additional transport costs that must be borne by the consumer, even if the products can be handled at all.

The key questions are: (1) what would be the direct impact on air express and air freight rates and transit times; (2) can existing flight networks accommodate the rule's onboard stowage requirements; and (3) can the existing hazmat systems absorb the enormous increase in volumes?

Under the existing rule, fully regulated shipments of lithium ion batteries must be shipped using Class 9 premium rates, and all shipments would presumably move under these rates with the proposed rule. Without regard to whether the air networks could handle all of the traffic volumes (see below), the cost premium would substantially increase total transport costs for most flown products. This increase in air shipping cost is repeated multiple times if more than one air segment is required. It is also likely that the full range of transport services (typically categorized by delivery time and shipment size) would not be available to shippers, particularly deferred delivery options.[10] It is also most likely that options for tendering and consolidating air shipments would be constrained, thereby increasing delivery times to market.

The second issue is particularly important for the express carriers due to the likelihood that all of these products would have to be "crew-accessible" on most of the aircraft operated in their fleets. The air express networks are primarily dependent on single flights operating once per day between a limited number of centralized hub airports and a wide range of geographically dispersed "service" (origin/destination) airports. Based on the low daily utilization of their planes, express carrier aircraft are typically operated up to 30 or 40 years and could not easily be converted without great expense and downtime to accommodate this rule. It is likely that a substantial volume of this traffic could not, and would not, be handled by the express carriers (both to/from and within the U.S and between foreign points) despite the heavy reliance on express service for distribution of these products.[11] Shipments would be delayed or additional flights would have to be operated, either of which would have a significant impact on rates, final product costs, and product demand (sales volume). The reliability that is so essential to express delivery would also be compromised if shipments are refused due to a lack of capacity, or if the level of Class 9 shipments for any particular flight is deemed too high by the pilot or the airline.[12]

The PHMSA analysis also assumes that existing air hazmat systems can be proportionally expanded to handle the enormous increase in traffic due to the rule. Air traffic statistics for Asian exports to North America show that only 0.02% of all shipments in 2008 were classified as "dangerous goods" or "requiring other special

[10] One company surveyed by CAC/TranSystems indicated that its products would not only have to incur the Class 9 premium, but they would have to upgrade to a higher base rate since Class 9 handling was not available for their current service.

[11] In 2008, it is estimated that 89% of the shipments of affected products between Asia and North America utilized express airline services that are mostly provided by U.S. express carriers (Exhibit 3-8). A similar share applies for shipments within Asia and to other world areas where FedEx and UPS are also the major transportation service providers.

[12] Without regard to an airline's policy, a pilot can refuse the loading of products that exceed that individual's percent for a "high" concentration of Class 9 materials.

handling" including only 0.01% in express services (see Exhibit 3-8). In contrast, the affected commodity groups accounted for 16.3% of total shipment volumes between Asia and North America (including 16.7% of express volumes). While not all of this traffic contains lithium ion batteries, even a low percentage would place an enormous burden on the existing air transportation systems.

The ultimate conclusion is that, at best, all of the affected products would have to absorb a new hazmat premium cost and experience some delay in transit times. Increasing operating costs coupled with a reduction in flight routing options, would increase general rates and inefficiencies in hazmat handling systems, and add additional travel time leading to even higher negative economic impacts.

- **U.S. Consumers** –U.S. consumers of affected electronic products ultimately bear the burden of increased distribution costs and extended delivery times. The manufacturing and distribution markets for these products are highly competitive. All cost and time impacts will be passed on to the customer who will pay more for an affected product and suffer a loss of "value" from delays in receiving that product. The value that consumers place on speed of delivery for these high-end electronic goods is indicated by the large share of customers who pay extra fees, usually $30-$60, for expedited delivery. In addition to the direct impacts on new products, the rule would also affect the transportation of lithium ion batteries for the purpose of repair or return. Customers would be required, one way or another, to absorb the high cost to ship products and batteries back to the manufacturer or a repair station, as well as the cost and delay in receiving a repaired product (or replacement battery).

3.3 Full Range of Cost and Time Impacts

The underlying assumption of the PHMSA's cost estimates is that the proposed rule could be easily accommodated with minor changes to packaging and handling at very little cost. The PHMSA analysis limits cost impacts to:

- Increases in unit packaging costs applied to a low level of shipment volumes which are based on the assumption that products can be consolidated into large shipment sizes without regard to market demand or transportation and distribution efficiencies; and
- Minor training and documentation costs by a small number of workers and only marginal changes to existing systems.

The PHMSA analysis ignores the following major points:

- The importance of logistics costs and efficiency to electronic product distribution systems;
- The dependence on cost and time-definite air cargo systems as essential components of the supply chains for these products;
- The extent to which access to fast and time-definite delivery is essential to retail customers and end-users; and
- The fact that the proposed rule would increase distribution costs and product delivery times and introduce uncertainty and inconsistency into these supply chains, all of which will negatively affect U.S. businesses and consumers.

In reality, the rule would have a substantial negative effect on the supply chains for some of the most prominent consumer products manufactured by U.S. and global companies and utilized by U.S. consumers. The following are the key categories of impacts that should have been addressed:

- **Packaging** – While the PHMSA provides an estimate for these costs (see Section 2.2), there is no recognition of the importance of packaging as part of product distribution systems, or the wide range of impacts that can be expected with this rule. Ultimately, the vast majority of these products (including replacement battery packs) are delivered to a final user as a single package unit, and it is unreasonable to assume that a manufacturer can consolidate products into larger package sizes, much less a package that contains the equivalent of 200-250 cells. It is likely that all final product packaging would increase in cost, not just for products moving by air, as the mode (or modes) of transport typically is not determined at the time of packaging.
- **Air Transport** – Affected products that are currently moving on a fully regulated basis incur higher air rates that incorporate the extra handling and documentation required by the carrier. A requirement for comparable levels of handling and documentation for all affected products will result in similar costs and increased rates at a minimum. It is likely that the enormous increase in volumes for carriers' hazmat systems coupled with the incompatibility of a significant portion of existing aircraft capacity will further increase these costs.
- **Other Cargo Handling and Storage** – While not well-explained, the PHMSA analysis accounts for extra training of manufacturer employees that package and handle these products, but it ignores training for many other types of entities that participate in the supply chain including freight forwarders, component suppliers and wholesale/retail companies, not to mention the handling that would occur after final product delivery (for repairs or returns). The rule would also affect warehousing and storage activities, much of which is handled by contractors.
- **Other Logistics Impacts** – The level of sophistication and investment in distribution/logistics systems has advanced significantly, particularly for the types of products affected by this rule which are dependent on fast, reliable, time-definite and

flexible delivery systems. The manufacturers of these products devote enormous resources to reducing logistics costs and delivery times at levels that may seem insignificant relative to the product's unit value, but which represent a major contribution to company profits and consumer satisfaction. Delays caused by this rule will directly translate into increased inventory carrying costs, and the increased unit transport costs will raise product prices resulting in sales reductions (and associated negative employment and other economic impacts).

The key deficiencies in the PHMSA cost analysis are: (1) a large underestimation of the scale of trade activity that would be affected, (2) the complete exclusion of transportation and other logistics cost impacts, (3) the significant secondary impacts on distribution and logistics systems, and (4) the cumulative effect on U.S. consumers and economic activity and the loss of U.S. jobs and industrial output as a consequence. These issues are addressed in the sections that follow.

3.3.1 Data Sources for CAC/TranSystems Analysis

The following analysis utilizes a number of publicly available trade and transportation data sources combined with quantitative and descriptive information gathered through a survey/interview program with selected PRBA members that are major shippers of the affected products. The data sources include:

- **U.S. Bureau of the Census Foreign Trade Statistics** – Census trade data identifies detailed commodity flows (at a 10-digit harmonized commodity level) for U.S. imports, exports and re-exports (of foreign-made merchandise previously imported). Statistics include commodity value, unit count and number of processed documents (or shipments) by country of origin/destination and Customs District of routing plus value and weight levels for the air and vessel modes. This data source was utilized to identify the volume and shipment characteristics for air trade flows of selected product categories that are affected by the rule (for a base year of 2009).

- **Commodity Flow Survey (2007)** – This data source is part of the 5-year Economic Census and provides volume and shipment characteristic data for domestic flows by general commodity category and mode of transport. Air shipment patterns for electronic and computer products are derived by combining "air" and "parcel, mail and courier" statistics.
- **Seabury Air Trade Data** – This data source provides value, weight and shipment counts by commodity group, origin/destination country and air service category (express and general air freight). Shipment data for outbound air trade from Asia by world region in 2008 was used to estimate foreign-to-foreign trade flows relative to U.S. air imports, and also used to characterize hazmat shipment flows.
- **Bureau of Labor Statistics Occupational Employment Statistics (May 2008)** – This data source identifies employment statistics for "transportation and material moving" occupations by employing industry. This source was used to determine the number of employees that might require training for industries that manufacture, distribute or trade affected products.
- **Annual State of Logistics Report (Council of Supply Chain Management Professionals (2008)** – This annual report estimates U.S. expenditures on logistics including transportation (by mode), supporting distribution/logistics services, shipper costs and inventory carrying costs. This data source was used to estimate impacts for other logistics services.
- **<u>Tariff Equivalents for Time in Trade</u>, U.S. Agency of International Development (March 2007) –** This study examined the impact of transportation delays on inventory costs for different trade commodity groups. The developed factors for inventory cost increases per day of delay as a percentage of commodity value were used to estimate inventory cost impacts.
- **PRBA Shipper Survey/Interviews –** Selected PRBA members provided information on affected trade flows, shipment flow patterns and expected impacts of the rule on distribution costs, product delivery times and overall performance of their logistics systems. A survey instrument (as provided as Appendix A) was used to collect the information, supplemented with lengthy phone interviews in some cases. A total of seven companies provided survey and/or interview information and the scope of

products covered by the survey is described below. The collected data was used to corroborate patterns identified from the secondary sources and develop inputs to the cost model, as well as provide aggregate impact estimates to compare with the cost model results.

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	# of Respondents
Battery Cell and Packs	5
Cellphones and Related Products	2
Notebooks and Handheld Computers	4
Audio & Video Products	2
Hand Power Tools	1
Other Electronic Products	2

3.3.2 True Scale of Affected Trade Flows

The proposed rule would apply to the air transportation of all lithium ion battery cells and packs, or products with batteries (except those batteries with a Watt-hour rating of not more than 3.7 Wh packed with or contained in equipment) that are shipped to, from or within the United States, or between foreign points using a U.S.-registered aircraft. This section describes the key characteristics of those flows that are relevant to cost impacts and estimates the base year flows of affected trade.

The level and shipment characteristics for flows of affected products will determine the total cost impacts associated with the rule as follows:

- **Affected Product Categories** – The affected products include lithium ion battery cells and battery packs and any product that contains, or is packaged with batteries, (except those lithium ion batteries which are packed with or contained in equipment and below the 3.7 Wh threshold). Commodities that fit this profile were identified for CAC/TranSystems by PRBA members using the harmonized schedule commodity code system. Individual products (by type and/or manufacturer) would experience different levels and types of impacts but are categorized as follows for this analysis:

  - Cellphones & Related Products
  - Notebook and Handheld Computers
  - Audio & Video Equipment
  - Hand Power Tools
  - Other Electronic Products
  - Lithium Ion Batteries

- **Air Traffic Levels** – The total volume of products that meet the minimum battery size threshold and that currently utilize affected air transport, can be estimated (using trade data and shipper survey information) for the following categories (each with distinct impacts):
  - U.S. Import
  - U.S. Domestic Distribution (of imported products),
  - Re-Export (of imported foreign products)
  - U.S. Export (of U.S. produced or assembled products).
  - Foreign-to-Foreign (of foreign-made products on U.S.-registered aircraft).
- **Number of Product Units** – Assuming that individual products will require compatible packaging, the total number of units flowing by trade lane determines the level of packaging impacts.
- **Number of Shipments and Average Shipment Weig**ht – Air transport rate for handling and documentation (and the anticipated Class 9 premium) depends on both the number of shipments (i.e., consolidations of individual packages for air handling) and shipment size.[13]
- **Total and Unit Value** – The unit value of individual products affects inventory carrying costs and the costs of any delays associated with the rule.

[13] Air rates and hazmat premiums typically are based on a minimum fixed rate and a variable component based on shipment weight.

The volumes and shipment characteristics for affected product trade were estimated using U.S. Bureau of Census foreign trade statistics (for calendar year 2009) combined with patterns derived from (1) the 2007 Commodity Flow Survey; (2) worldwide air trade data from Seabury; and (3) a survey of representative PRBA members.

U.S. International Trade

Total trade and trade by air for affected products to, from and through the U.S. is summarized in Exhibit 3-3 based on Census trade data. The Census data provide detailed commodity flow statistics by origin/destination country for all modes (combined) including total value, number of units (for most commodities[14]), and number of filed import documents (which is assumed to represent the number of shipments[15]). Trade data is available for U.S. imports, U.S. exports (of domestic-made or assembled products), and U.S. re-exports (of foreign-made products transshipped via a U.S. point). Trade data are aggregated for Canada, Mexico and all other countries ("Overseas"). Air trade data provides total value[16] and weight but does not directly identify the number of units or shipments.

As shown in Table 3-1, the affected product categories accounted for $72.6 billion of U.S. air imports in 2009, or nearly three-quarters of the U.S. trade for those products.[17] The import of lithium ion batteries by air amounted to $507 million or 72% of total inbound trade. U.S. exports and re-exports account for another $15.1 billion of trade value, also nearly three-quarters of total outbound trade. The ratio of re-export value to import value averaged 10% for all of the categories combined, ranging from 3% for hand power tools to 19% for other electronic products (see Exhibit 3-3).

[14] Total units by aggregate product category are estimated for commodities that lack unit counts by assuming the same unit value as the commodities within the same category that do have reported unit counts.
[15] This assumption probably understates the number of shipments and overstates the average shipment size as some shipments may be handled separately but documented under a consolidated waybill for Customs purposes.
[16] Air trade value is adjusted for "overseas" trade to account for trade transshipped via Canada or Mexico. It is assumed that the air share of total trade (that includes trade via truck or rail) is equal to the share of air and vessel value combined with the same adjustment made to air shipment weight.
[17] The trade statistics do not identify which products had lithium ion batteries meeting the 3.7 Wh threshold – this adjustment is made in the cost model (Exhibit 3-10).

Table 3-1
U.S. Trade for Affected Products (2009)

	2009 Trade Value (million $0		
	Total	Air	% of Total
U.S. Imports			
Cellphones & Related Products	$48,704	$37,542	77%
Notebook and Handheld Computers	$26,915	$23,321	87%
Audio & Video Equipment	$16,236	$9,041	56%
Hand Power Tools	$1,753	$53	3%
Other Electronic Products	$5,791	$2,633	45%
Combined Total	$99,399	$72,590	73%
Lithium Ion Batteries	$702	$507	72%
U.S. Exports and Re-Exports			
Cellphones & Related Products	$12,180	$9,214	76%
Notebook and Handheld Computers	$4,110	$2,750	67%
Audio & Video Equipment	$1,678	$1,154	69%
Hand Power Tools	$104	$12	12%
Other Electronic Products	$3,090	$1,993	64%
Combined Total	$21,163	$15,124	71%
Total – All Commodities	$121,264	$88,221	73%

Source: Exhibit 3-3

Air shipment volumes and characteristics related to cost impacts were derived as follows:

- Average unit size (in weight) and average shipment size (in units) were estimated for air trade from inbound and outbound trade flows (as defined by 10-digit HS commodity and country of origin/destination) for which air accounted for at least 90% of total trade (Exhibit 3-5).
- Total units by air were derived using total air weight and the average unit size (limited to a maximum share of total units based on the higher of the air share of total value and 90%).

- Total shipments by air were derived using total units and the average shipment size (limited to a maximum share of total shipments based on the higher of the air share of total value and 90%).

Table 3-2 summarizes total trade by direction and product category for 2009. The total number of products possibly affected was 388 million for U.S. imports of electronic products plus another 47 million battery cell and packs. A total of 832,000 shipments involved electronic products plus over 18,000 battery shipments. Outbound shipments of domestic and foreign products totaled 37 million units and 456,000 shipments.[18]

Table 3-2
Air Trade Volumes for Affected Products (2009)

	2009 Trade Value			
	Units (millions)	Shipments (000)	Kilograms per Shipment	Value per Unit
U.S. Imports				
Cellphones & Related Products	219.2	349.0	342	$171
Notebook and Handheld Computers	38.1	256.7	569	$613
Audio & Video Equipment	99.6	118.3	448	$91
Hand Power Tools	0.7	4.1	317	$78
Other Electronic Products	30.8	104.9	184	$85
Combined Total	387.7	832.0	379	$187
Lithium Ion Batteries	46.8	18.2	553	$11
U.S. Exports and Re-Exports				
Cellphones & Related Products	19.6	245.1	112	$471
Notebook and Handheld Computers	4.3	86.9	184	$634
Audio & Video Equipment	7.6	37.1	140	$152
Hand Power Tools	0.1	1.1	489	$119
Other Electronic Products	5.2	85.5	143	$382
Combined Total	36.8	455.7	134	$410
Total – All Commodities	471.4	1,305.9	296	$446

Source: Exhibit 3-3

[18] The relatively high volume of outbound shipments when compared to imports is based on significantly lower shipment sizes and higher unit values for the outbound flows.

U.S. Domestic Distribution

Air transportation is also an essential component of the domestic distribution systems for affected products with great variability depending upon the product type and manufacturer. Domestic air services are used to distribute product (mostly imported) from manufacturers' distribution centers to end users and retail/wholesale companies with the latter group also utilizing air for distributions to their customers. Product users also use domestic air transportation, to ship products for return or repair (as known as reverse logistics) with repairs often moving by air in both directions.

For the purpose of this analysis, the key question is the ratio of domestic air shipments to inbound international shipments, inclusive of all of the flow types identified above (e.g., manufacturer-to-retail/wholesale or retail/wholesale-to-end user). There is very limited data on U.S. domestic flows by air. The only available public source is the Commodity Flow Survey which was most recently conducted as part of the 2007 Economic Census. As shown in Exhibit 3-6 (which is based on the Commodity Flow Survey), computer and electronic manufacturers shipped a total of $268 billion in product value in 2007 accounting for 2.6 million metric tonnes at an average value of $105 per kilogram. Shipments by air [estimated as the combination of traffic identified for the "Air (including Truck)" and "Mail and Courier" modes] accounted for 52% of the value and 20% of the weight at an average value of $274 per kilogram. As with foreign trade, higher valued products are more likely to move via air, thereby accounting for the differential in average value for this sector.

The secondary transport of electronic products by retailers and wholesalers is also dependent on air transport within the U.S. Electronic shopping and mail-order houses used air for 77% of total shipment value and 70% of shipment weight, while wholesalers of electrical and electronic goods averaged 41% of value and 8% of weight in 2007. Combined, air transport accounted for 45% of value and 11% of weight. The high participation of non-manufacturers in the domestic distribution of electronic products is indicated by a ratio of air trade value for electronics wholesalers to that of manufacturers of 0.81 (with a 2.50 ratio for shipment weight). It is reasonable to assume that for every shipment of electronics generated by a manufacturer, there is at least one other shipment that originates from a non-manufacturer.

While it is likely that the air share of domestic distribution for affected products is less in terms of aggregate value and weight than it is for foreign trade, based on the ability to use surface transport, the higher share of trade being shipped to end-users will result in a proportionally higher share of shipments. As shown in Exhibit 3-6, small package shipments of electronics by air (less than 50 pounds or 23 kilograms per shipment) accounted for 58% of the total value and 42% of total weight in 2007 with 94% of value and 88% of weight shipped in sizes of less than 500 pounds (227 kilograms). The average value for shipments under 50 pounds is $157 per kilogram, almost double that for all other shipments. Assuming average shipment sizes at the midpoint of each shipment size category, it is estimated that shipments under 5 pounds account for 82% of the total electronics shipments.

The high dependency on air transport for domestic distribution is supported by responses from the CAC/TranSystems survey of PRBA members. For battery cells and packs, manufacturers shipped from 10% to 15% of their units by air domestically, while electronic product manufacturers shipped 50 to 100% of cells and packs by air (with a large proportion as single units to end users). Shippers of electronic products themselves averaged 10% to 25% of their units moving via air.

<u>Foreign-to-Foreign Trade</u>

The proposed rule would also affect trade between foreign points that is currently moving via U.S. express and other airlines (or on U.S.-registered aircraft operated for foreign airlines). Statistics for outbound air trade from Asia to the world for 2008 (Exhibit 3-8) can be used estimate the extent of these impacts.

While the U.S. is typically the largest world market for most high-end consumer products, a significant amount of air trade also supports retail markets in other parts of the world. As shown below, the ratio of air shipments to points other than North America ranges from 1.17 for computers to 3.24 for radio and mobile telecommunications products. Substantial shares of these shipments are moved by air express services ranging from 75% for tools to 91% for computers. While not all express shipments move on integrated carriers such as FedEx and UPS and the U.S. carriers do not handle all of the integrated carrier traffic, it is very conservative to assume that 25% of express shipments of the affected products will move on U.S. aircraft covered under the proposed rule.

	Rest of World-to-North America Shipments	Express Share
Radio & Mobile Telecommunications	3.24	86%
PC's and Laptops	1.17	91%
Home Entertainment Equipment	1.72	79%
Tools, Tooling & Machine Tool Parts	2.70	75%
Weighted Average	1.80	87%

Source: Exhibit 3-8

3.3.3 Full Range of Cost Impacts

Scope of Impacts

The proposed rule will increase the cost and time to transport affected products by air with cumulative effects throughout the global supply chains for manufacturers, distributor and wholesale/retail firms. Products will require enhanced packaging prior to loading on an affected flight. Air transport costs will increase to account for additional handling and documentation that will apply to all air segments of a product's distribution chain. All personnel involved in the packaging and handling of these products for air transport will require enhanced hazmat training. Increased hazmat handling and documentation will also increase transit times and result in increased inventory carrying costs. All of the associated cost increases will translate into increased product costs and declines in sales volume, as well as a decline in customer satisfaction. The following sections describe the anticipated types and levels for these costs impacts.

Packaging

The PHMSA analysis correctly identifies a significant increase in unit packaging costs but applies those costs to a limited number of shipments and wrongly assumes that package sizes can be easily modified with no regard to existing distribution methods and patterns. The PHMSA's projected increase of $1.25 to $1.50 per package was confirmed as reasonable by the survey respondents, with some variance between products and manufacturers (ranging from $0.06 to $1.69 per unit with most packages handling single product units). The following are conservative estimates for the unit packaging costs based on the survey responses (and relative to the lower estimate developed by PHMSA):

Batteries	$0.05 per unit	Based on an average of 25 units per package
Cellphones	$0.61 per unit	Based on $1.25 package with 80% as single units and 20% in units of 5
Hand Power Tools	$1.75 per unit	Based on more complex and larger package types of highly variable sizes and shapes leading to high re-design costs
All Other	$1.25 per unit	Based on PHMSA estimate

The packaging impacts are applied to all imported products, as well as domestically-made or assembled products for export to other countries. Packaging costs are also applied to hand power tools that are re-exported or transferred domestically, but not to any other commodity group.[19] The measured cost impacts do not include any re-packaging that might be required for products that must be reconfigured for air transport after original packaging, or any additional packaging that might be required for transport purposes only.

Air Transport

The PHMSA analysis takes no account of the significant costs that will result from a combination of the enhanced handling and documentation required for Class 9 transport, and the negative effect the rule will have on the supply and efficiency of air freight services. Airlines charge a premium that is that is charged on a per shipment basis and based on the size of the shipment. The shipper survey identified a large range of impact levels ranging from $30 to over $2,500 per shipment. A standard pricing formula identified in the survey combines a minimum shipment fee with a weight-based fee applied to larger consolidated shipments (but not for smaller shipments of single units). The survey identified a range of $30 to $70 as the fixed shipment fee and a conservative estimate of $35 per shipment was used in the cost model. The

[19] This is based on the conservative assumption that all re-exports or domestic transfers for other electronics involved products that were imported and were all packaged overseas. As identified in the survey, the re-export/domestic trade in hand power tools is based on products shipped to the U.S. without batteries and would therefore require compliant packaging within the U.S.

weight-based rate was estimated at $1.50 per kilogram (as provided by the survey).[20] The weight-based fee was applied to 75% of the international shipments and 10% of domestic shipments (based on the expected mix between single unit shipments and consolidated shipments).[21]

The transport cost impacts do not include any increases in the base air freight rates due to a loss of efficiency and capacity for air carriers, nor the loss of access to some markets and the price effect of reduced competition. As described above, the proposed rule will drastically limit the availability of adequate capacity to handle the large volumes of affected electronic products, particularly within the worldwide express networks of U.S. integrated carriers. A market that depends on expedited guaranteed delivery by air will be faced with delays and uncertainty. This aspect of the proposed rule's impacts, which was not even considered by the PHMSA, was a primary concern of many of the surveyed shippers with the expected impact far outweighing any direct costs to modify existing distribution systems. For example, one shipper's distribution system depends on a well-designed mix of full planeloads of products delivered from overseas to major distributors and direct express shipments to consumers and retail stores. The loss of stowage for most all-cargo aircraft will effectively eliminate the full freighter option, while limited access to express networks will eliminate the key option to expedite some shipments. One shipper also noted that, in anticipation of the rule, some major retailers for their products are eliminating some air-only destinations (e.g., Alaska, Hawaii and Puerto Rico) for overnight delivery.

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[20] Average shipment costs for respondents that calculated impacts based on detailed shipment records were within a reasonable range of what those costs would have been if this formula ($35 per shipment plus $1.50 per kilogram) had been applied.

[21] The domestic share of 10% (as larger packages) was based on Commodity Flow Survey data (Exhibit 3-7) that shows a high concentration of shipments in the larger shipment size categories (18% over 11 kilograms and an average of 22 kilograms per shipment as estimated by CAC/TranSystems). It is reasonable to assume that a 10%/90% split between consolidated and single unit shipments for domestic flows. The average shipment size for U.S. international trade is much higher at 314 kilograms (Exhibit 3-3) and the survey identified very low shares of import shipments moving in single units directly to end-users (ranging from 0% to 20% depending on the product and manufacturer). The estimate of 75% of international trade moving in consolidated shipments is therefore conservative.

Other Logistics Cost Impacts

Packaging and air transport costs are just two elements in very complex distribution systems used to deliver the affected products to end users. Total logistics costs also include costs for inventory, intermediate handling, insurance and warehousing. The PHMSA analysis does not consider fully the implications of the rule beyond minor packaging and handling modifications.

A key shortcoming of the PHMSA analysis is the lack of appreciation for the importance of customized and optimized logistics systems required to satisfy the demand for these consumer products. U.S. business logistics costs were estimated at $1.4 trillion in 2008 which represents a significant share of the U.S. economy at (10% of national GDP). As shown in Exhibit 3-9 (and based on an annual report by the Council of Logistics Management), transport costs represent over half of those costs, but supporting industries and inventory carrying costs are also significant and these cost categories would also be affected by the rule. The PHMSA analysis limited most of its minor cost impacts to direct shipper costs which, as shown, account for just 1% of total logistics costs as compared to freight forwarder, warehousing[22] and logistics administration costs at 14%, or approximately 24% of direct transport costs.

Inventory carrying costs are also substantial and account for 27% of total logistics including interest charges (7%) and other financial charges (over 19%). For every dollar spent on transportation carrier services, another $0.46 is incurred for inventory costs.

The rule's impact on non-transport logistics costs will include inventory carrying costs related to longer transit times and increased costs for handling and storage by manufacturers and cargo support industries (including the training costs identified in the PHMSA analysis).

[22] Warehousing costs can also be categorized as inventory carrying costs, but are grouped with the transportation support service sector for this analysis.

The impact on cargo handling and storage activities in the support industries is based on the ratio of those sectors' costs to the direct cost of direct transport. It is estimated from the CLM data that every additional dollar of transport cost impacts generates $0.24 of cost impacts for the supporting sectors.[23]

The impact on inventory carrying costs can be measured based on the anticipated delays in product delivery times for the various trade flow categories, the average value of the affected products, and an estimated financial cost per day of delay. The assumed impacts are based on the following:

- The shipper survey identified significant delays that would apply to each air segment involved in a complete product distribution process. The delay estimates ranged from 1 to 2 days up to 7 to 10 days with those delays applying to all types of air trade flows (e.g., imports, exports). For the cost analysis, average delays were conservatively estimated at the lower end of the range for international shipments (1.0 days per shipment) and even lower for domestic distribution of imported products (0.5 days based on the ability to shift to truck delivery).
- The average product value for each product category is derived from the foreign trade data (see Exhibit 3-3).
- Inventory carrying costs during the distribution process are determined by the value of product inventory, the average distribution time, and the appropriate of capital and other financial costs. A USAID study[24] estimated the relative cost of transit delays for a range of product categories as a percentage of total shipment value per day of delay. For this analysis, the following factors were applied to the affected product categories:

USAID Category	Affected Product Category	Value per Time Saving per Day
Telecom, sound recording & Reproduction app and equip.	Cellphones & Related Products Audio & Video Equipment Other Electronic Goods Lithium Ion Batteries	0.9%
Office machines & automatic data processing machines	Notebook and Handheld Computers Hand Power Tools	0.5%

[23] This is a very conservative assumption as the ratio of total logistics costs to direct transport costs will be much higher for high-end consumer products as compared to general commodities.
[24] Calculating Tariff Equivalents for Time in Trade, U.S. Agency of International Development (March 2007).

The estimated impacts do not consider the likelihood that air transport will not be an option for some product flows and the high impact of converting to surface transport modes on inventory costs. As an example, the difference between air and ocean delivery times on the critical China-to-U.S. West Coast trade lane was 8 to 12 days (based on estimates by the Vessel Operators Hazardous Materials Association). Combining the USAID inventory cost factors with these delays would add 4% to 11% to delivered cost of products currently imported by air from China, and that assumes no other cost or time delays.

Training and Other Shipper Cost Impacts

The PHMSA estimates of direct labor impacts on shippers was limited to just $750,000 per year inclusive of training and information collection costs. While the short response time limited the ability to estimate these impacts, three responses to the shipper survey provide a basis for more reasonable estimates as follows:

- Total training costs for just three shippers were nearly $2 million per year to train over 4,000 employees.[25]
- The cost per trained employee varied from several hundred dollars to several thousand and averaged over $400 per trained employee. (In contrast, the PHMSA estimates are based on an average of $30 per trained employee.)
- The number of employees requiring training relative to affect shipment volumes ranged from 1 per 1,000 shipments up to over 60 per 1,000 shipments with an average of just over 10.

In the cost analysis, average factors derived from these results ($400 per trained employee and 10 employees per 1,000 affected shipments) were combined with the relevant volume statistics.

Based on the enormous impact the rule will have on the entire logistics systems for affected shippers, it is likely that the total labor cost impacts will be much higher than that

[25] The values provided from the survey are presented in very general terms in order to avoid identifying sensitive business information, but the average factors are very close to the actual values.

required for shipment handling and documentation alone. The management and analytical time necessary to adjust all production, packaging, and distribution activities to meet the rule's requirement will be substantial.

The PHMSA also did not consider the impact on end users who might need to ship these products back to the manufacturer or to a third party for repair or recycling purposes with activity levels estimated in the millions by some of the survey respondents. Home users shipping a cellphone for repair will absorb the same cost and time impacts as the original manufacturers with a similar loss of efficiency and productivity.

3.3.4 Impacts on U.S. Consumers and Businesses

One major stakeholder that will ultimately bear the burden of increased distribution costs and delivery times for these electronic products will be U.S. consumers, retailers, wholesalers and other service industries responsible for providing those goods. The ability to quickly obtain the latest technology in consumer products in an efficient, reliable and cost-effective manner will be hindered by the rule and lead to a decline in the "consumer surplus" associated with these products.[26] While it is difficult to measure, one metric would be the net impact on sales for these products. It is assumed that these products have a price elasticity of 1.0 and that a 1% increase in cost will result in a 1% decline in units sold and total sales.

In addition to the direct effects that the rule will have on existing trade flows, the rule will have secondary effects in terms of discouraging product innovation, particularly with respect to new uses for, and improvements in, lithium ion batteries. As U.S. manufacturers lead the world in the development of innovative products, it is likely that the rule will diminish this competitive advantage and divert market share to lower-cost lower-quality foreign-designed products.

[26] "Consumer surplus" is an economic concept that measures the difference between the value consumers associate with a good and service and the price that is paid, and is an attempt to measure the qualitative benefits from the ability to obtain that good or service.

3.4 Estimated Cost and Time Impacts

3.4.1 Cost Impact Model Methodology and Input Assumptions

The impacts of the proposed rule on base year trade flows were estimated using a cost impact model that combines the 2009 U.S. trade flow patterns with the various unit impact assumptions described above (see Exhibit 3-10). The methodology is based on the following (using impact factors more fully explained in Section 3.3.3):

- Trade Flow Volumes – International trade flow characteristics by direction were based on Census data estimates (Exhibit 3-3). The domestic shipment activity was estimated relative to U.S. import volumes (in value, units and weight) as derived from the survey responses (50% for hand power tools[27], 50% for battery cells and packs and 20% for all other products). Average shipment sizes for domestic volumes are estimated at 20% of average shipment size for imported products in the same category.[28] The average shipment size factors are used to estimate shipment volumes based on the domestic unit volumes.[29]
- Share of Trade Flow Volumes Affected by the Rule – Based on the industry survey, the following shares of trade flow volumes were estimated to have packaging and other impacts (i.e., shipped with battery meeting minimum power threshold)[30]:

[27] The distribution of imported hand power tools includes a large volume of products that are married with the lithium ion battery in the U.S. It is estimated that there is one unit fitting this profile for every one that is imported into the U.S. by air with a battery.

[28] These estimated shares are very conservative considering the average shipment size for all electronic products shipped by air domestically (including domestically manufactures) was 22 kilograms in 2007 (Exhibit 3-6) compared to 314 kilograms per shipment for the affected products moving as U.S. air trade (with the U.S. import average exceeding 400 kilograms per shipment). The survey also identified a significantly higher share of domestic air shipments moving as single units to end-users than for imported products.

[29] In the summary statistics, aggregate totals for units, value and weight do not re-count products that are re-exported or transferred by air domestically. However, aggregate shipment totals do count re-shipments (i.e., an product imported by air and then transferred by air to a domestic destination counts as two shipments).

[30] While most of the surveyed shippers estimated that high shares (mostly 100%) of their air shipments would be directly affected by the proposed rule, the lower shares were conservatively used to account for products that are either not powered by a lithium ion battery or that may be shipped by air without a battery internationally. The domestic shares are higher than the international shares under the assumption that all would contain a battery.

	International	Domestic
Cellphones & Related Products	50%	60%
Notebook and Handheld Computers	50%	75%
Audio & Video Equipment	50%	60%
Hand Power Tools	50%	60%
Other Electronic Goods	50%	60%
Lithium Ion Batteries	75%	90%

- Packaging Impacts – The unit impact for packaging were estimated as describe in Section 3.3.3.
- Air Transport Impacts – The hazmat premiums for air transport were calculated based on the assigned average shipment sizes by commodity group and a rate formula of $35 per shipment plus $1.50 per kilogram applied to 75% of international shipments and 10% of domestic shipments (see Section 3.3.3).
- Related Services Impacts – Total impacts inclusive of non-transport services such as forwarding, warehousing and logistics management are estimated based on 24% of the direct transport impacts (see Section 3.3.3).
- Inventory Cost Impacts – The cost impact of additional transit times is based on the unit average value for each product category and flow type, assumed delay times by flow type (international = 1.0 days and domestic = 0.5 days), and a value of time factor (0.5% per day for notebooks and hand power tools and 0.9% per day for all other products).
- Training Impacts – The shipper training costs are estimated based on an assumption of 10 employees trained per 1,000 shipments at an average of $400 per employee.
- Lost Sales Impacts – The number of units and sales revenue lost due to increased costs are estimated based on the average product value and average cost impact per unit for each commodity group, and a conservative price elasticity of 1.0, applied at the final delivery point.[31]
- Foreign-to-Foreign Trade Impacts – The impact on foreign-to-foreign trade is based on (1) the ratio of Asia-origin air shipments for “Rest of World” destinations to

[31] The unit cost impacts for re-exports and domestic transfers include the impact for the import leg, while the impact on import sales exclude those flows.

"North America" destinations for each traffic category; (2) the express share of air shipments to "Rest of World" destinations for each traffic category; (3) an estimate that 50% of that trade would affect U.S. companies[32]; and (3) an estimated share of 25% that move on U.S. airlines and would be affected by the rule.[33] A combination of these factors produces a share that is then applied to the total impact for U.S.-related trade.

3.4.2 Cost Impact Estimates

The direct cost impact for U.S.-related trade is estimated at $1.0 billion for the base year including $183 million in packaging costs, $386 million in transport and related costs, $431 million of inventory carrying costs, and $8 million in shipper training costs. Cellphones account for the largest share of these impacts at $479 million followed by notebook and handheld computers ($266 million) and audio and video equipment ($178 million). On average, these cost impacts add $2.47 per shipped unit (or 1.2% of the product value) and $299 per shipment. Increased logistics costs are projected to result in a loss of 5.4 million unit sales by affected manufacturers. The rule's impact on foreign-to-foreign trade is estimated at an additional $249 million for a total cost impact of $1.3 billion per year.

The conservative nature of these estimates can be demonstrated by comparing them to the total impacts estimates by the limited number of shippers responding to the survey that combined projected annual impacts of up to $450 million for U.S. related trade only (or about 45% of the total estimated in the model). Note that these cost impacts did not include all of the impact categories for each shipper, and none included estimates of inventory cost impacts.

[32] While it is likely that the companies participating in U.S. air trade will also be similarly represented in other trade markets, this conservative estimate accounts for intra-regional trade and the possibility that these other world markets have lesser concentrations of products using lithium ion batteries.

[33] The first two factors are based on the Seabury air trade statistics for 2008 matching the affected product categories to Seabury's grouping (see Exhibit 3-8). Foreign exports of batteries (which is not separately identified in the data) uses a ratio of 1.00 for the trade volumes and the average of the other categories for the express share of trade. The low share of affected express trade assigned to U.S. airlines is also conservative considering that FedEx and UPS are the world's largest express airlines by a large margin.

4.0 The PHMSA Benefits Analysis Is Erroneous and Unsupportable on Its Face

It is important at the outset of this discussion to note that the PHMSA Cost-Benefit Analysis talks in terms of "reducing" the risk of fire on aircraft.[1] Furthermore, at page 18, the PHMSA report states: "PHMSA and FAA cannot say definitively that the lithium battery fires would have been prevented had the provisions of this NPRM been in effect at the time the fires occurred" (emphasis supplied). The FAA has used accident data and Monte Carlo simulation models in the past to predict likely outcomes and the estimated benefits from newly proposed regulations.[2] PHMSA did not develop any probability models or expected value calculations for the instant analysis. It simply assumed 100% effectiveness in saving the costs of fire and catastrophic loss of aircraft, even though the majority of all the incidents PHMSA relied upon did not occur on the aircraft at all. Similarly, PHMSA reported no accident data to demonstrate any cause and effect between the air transportation of lithium cells and batteries, and aircraft accidents. The entire PHMSA analysis is based upon a review of incidents, not accidents. It is customary in FAA rulemaking of this nature (safety) to relate the proposal to an accident history, and not to incidents, which may or may not bear a causal relationship to aircraft accidents.

4.1 The PHMSA Empirical Evidence of Aviation Incidents Related to Lithium Ion Battery Transportation

The PHMSA's primary database used to analyze the rate of lithium battery incidents is presented in the table on page 15 of the BCA. For the period from March 1991 through September 2009 it reported 44 total incidents. Seventeen (17) incidents occurred in the passenger cabin of passenger aircraft or in checked passenger baggage. These 17 incidents are not addressed by this rulemaking and are therefore outside the scope of this rulemaking.[3] Consequently, only 27 incidents are relevant to this inquiry. Of the 27 lithium battery incidents, 17 are alleged to have involved lithium ion batteries, 16 in all-cargo aircraft transportation, and one incident related to cargo stored in the belly of a passenger plane. All 17 of these lithium ion

[1] PHMSA Cost-Benefits Analysis, p. 14.
[2] See, for example, Federal Aviation Administration (FAA), Draft Regulatory Evaluation, Initial Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessments, AOP 310, May, 2008. See also, Federal Aviation Administration (FAA), Economic Analysis of Investment and Regulatory Decisions – Revised Guide, January, 1998, pages 22 – 25 and 100 ff.
[3] See NPRM, Federal Register, January 11, 2010, page 1303.

battery incidents occurred between October 1998 and August 2009, an eleven year period. The average incident rate was, therefore, 1.55 per year. The PHMSA's inflation factor used to estimate future incidents[4] would yield a forecast future incident rate of 2.2 lithium ion battery incidents per year. This covers all U.S. registered aircraft operating throughout the world.[5]

4.2 There is No Evidence that Any of the 17 Lithium Ion Battery Incidents Caused Aircraft Damage

The CAC/TranSystems team has examined the "Incident Summary" notes provided in the FAA source documents that PHMSA relied upon and cited. From this review only the passenger flight and 3 of the 16 all-cargo flights experienced smoldering or fire when the batteries were stowed in the aircraft. The vast majority of incidents occurred prior to boarding, after ULD breakdown in the sort center or cargo facility, or in the customs office.[6] In no case is there mention of aircraft damage, or even damage to the ULD itself. It appears that only limited amounts of cargo were damaged in the 17 relevant incidents.

4.3 PHMSA Has Overstated the Cost of Lithium Ion Battery Incidents By 99.9%

In any cost-benefit analysis prepared to assess the desirability and efficacy of a proposed rulemaking or infrastructure investment, the projected benefits should be based on the estimated level of benefits <u>with</u> and <u>without</u> the rule. In this case, the projected level of damages (cost savings) should be based on the factual history of relevant accidents involving air transportation of lithium ion batteries. This history should then be adjusted to account for future growth, declining incident rates (e.g. incidents per 100,000 flights), and any known policies or conditions that will mitigate future occurrences. The net benefits of the proposed rule should be based on the difference between the projection of benefits (or savings) under status quo conditions, and the projections with full implementation of the rule.[7]

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[4] 3.0 ÷ 2.1 = 142.9% (PHMSA Cost-Benefit Analysis, page 16).
[5] It is useful to note that both UPS and FedEx serve over 200 countries.
[6] The 17 incidents involving lithium ion batteries are listed in Exhibit 4-1.
[7] FAA, op. cit., pages 12 – 17.

PHMSA did not follow these guidelines. It chose not to examine historical aircraft accidents and damages associated with lithium ion batteries, but rather it utilized experience from unrelated hazmat and other passenger aircraft fires to provide a basis for estimating future benefits. This is a fallacious assumption. PHMSA did not examine available up-to-date data that measure historical damages from lithium ion battery incidents on aircraft, but rather selected unrepresentative and unrelated historical data that overstate potential benefits, such as the losses from the 1996 ValuJet crash. PHMSA did not provide any support that the rule would completely mitigate all of the future damages, however they are measured. In brief, PHMSA's projected cost savings (benefit) should have been based on the actual damages associated with these incidents, and they are not.

PHMSA has inappropriately used cost evidence from 15 fires aboard passenger aircraft during the 1995 – 2004 period to estimate the benefits of its proposed rulemaking. One of these fires involved the catastrophic loss of the ValuJet DC-9-30 and its passengers and crew. PHMSA claims the total loss from the 15 fires was $487.7 million, of which $336.0 was accounted for by the ValuJet crash. The ValuJet fire and subsequent crash were due to the improper handling of empty oxygen canisters. It had nothing to do with lithium batteries and is completely irrelevant to this rulemaking. Eliminating ValuJet from this population leaves 14 aircraft fires with a loss value of $151.7 million, although there is no evidence provided by PHMSA that any of them are relevant to this inquiry.

The passenger aircraft fires could have resulted from a wide variety of causes. PHMSA does not provide the cause of fire. Nor does it assert that any of them were caused by lithium batteries, or lithium ion batteries.[8] We assume that these 14 passenger aircraft fires were among the 45 hazardous materials fires PHMSA cites at page 18. These fires occurred on aircraft in the 10 year period from 1995 through 2004. Only four of the fires (9%) involved shipments of lithium batteries. Of the 44 lithium battery incidents cited at page 15, only 17, or 38.6%, were

[8] One cannot be certain from the PHMSA language whether four of the flights contained lithium batteries which may or may not have been the cause of fire, or whether it intended to assert that lithium ion batteries were the cause of four fires.

potentially relevant[9] lithium ion battery incidents. Consequently, following the PHMSA logic, its adjusted number of estimated lithium ion-related fires on aircraft would be 1.54 over a 10 year period.[10]

The HMIS records sourced by PHMSA[11] can be accessed on-line by the public. Data are available on-line for the years 1998 through 2009, but not earlier than 1998. CAC/TranSystems analyzed the data for the 12-year 1998-2009 period (Exhibit 4-6) and discovered the following:

(a) There were a total of 17 incidents of fires on aircraft related to lithium-based commodities for an average of 1.4 incidents per year.
(b) Damages from fires on aircraft involving hazardous materials totaled just $456,000 between 1998 and 2009 or just $38,000 per year with incidents involving lithium-based commodities accounting for just 23% of that.
(c) In fires where lithium was involved, the average cost per fire was $6,188 with a total of $37,000 in damages over the last five years..
(d) There is no upward trend in aircraft fires per year.

This examination of the HMIS evidence raises the question of why PHMSA cherry-picked its time period for its analysis, and why it included fire incidents (like ValuJet) and possibly others that have no relevance to this inquiry. PHMSA's deliberate actions to distort the truth cannot be condoned.

To estimate future cost impact, CAC/TranSystems conservatively assumed 1.54 lithium ion fire incidents would occur in the next 10 years.[12] Since the average fire involving lithium batteries has cost $6,200, the next 10 years of relevant lithium ion incidents could cost approximately $10,000,[13] or an average cost of $1,000 per year (Exhibit 4-2).[14] **This is 99.9% less than the $10.0 million annual benefit claimed by PHMSA (Exhibit 4-3)**.

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[9] Incidents occurring in the passenger cabin or in passenger checked luggage are outside the scope of the NPRM and therefore irrelevant to the cost-benefit analysis.
[10] 4 x 38.6% = 1.54.
[11] See PHMSA, Cost-Benefits Analysis, December, 2009, page 18.
[12] See above and an assumed constant trend in fires per year,.
[13] $6,200 per fire x an estimate of 1.54 fires per year over the next 10 years.

The series of unsupported estimates produced by PHMSA is shown in Exhibit 4-3. As discussed above, CAC/TranSystems has made adjustments to the PHMSA estimates and presented its cost estimates in Exhibit 4-2. As shown in these exhibits, PHMSA has overstated the prospective savings (benefits) by 99.9% largely because it loaded up the calculations with irrelevant incidents, damages and aircraft losses, and cherry-picked its preferred historical time period and fire incidents.

In the case of historical lithium ion battery incidents, no evidence has been provided by PHMSA that any aircraft damage resulted from the incidents; no injuries to people were reported; and no loss of life was reported. However, for purposes of this notional analysis CAC/TranSystems assumes that damages to aircraft, ULD's, cargo and people would be at most $1,000 per year due to the air transportation of lithium ion batteries under current rules.

4.4 PHMSA's Assessment of Potential Catastrophic Loss Is Unjustified and Inappropriate

There are hundreds, if not thousands, of reasons why an airplane may crash. PHMSA has presented no historical evidence of any aircraft crash (total or partial loss), or even an aircraft accident, that can be traced to a problem from carrying lithium metal or lithium ion batteries. PHMSA has simply assumed hypothetically that either a "medium" sized passenger aircraft or a "medium" sized all-cargo aircraft will crash with a total loss of life. PHMSA provided a range of benefit-cost ratios depending upon which type of plane would be involved in its assumed crash, and depending upon whether such an accident occurred in the first or the tenth year in the future. Given the fact that PHMSA has not produced a single piece of evidence of any historical aircraft accidents where the probable cause was lithium ion or lithium metal batteries, and therefore no past aircraft were damaged and passenger/crew members injured or killed, it is erroneous to incorporate such purely speculative events in a benefit-cost analysis that is being used to support a rulemaking initiative.

[14] The theoretical annual benefit from avoiding all fires involving both lithium metal and lithium ion batteries is $1,600 (27/17 x 1000).

Notwithstanding PHMSA's unjustified inclusion of catastrophic aircraft loss in its benefits assessment, CAC/TranSystems is compelled to comment and correct PHMSA's erroneous analysis. The CAC/TranSystems adjustments still produce a conservative benefits estimate.

4.4.1 CAC/TranSystems Adjustments to PHMSA's Estimates of Catastrophic Loss Savings

PHMSA has made several profound errors in its hypothetical analysis.

(a) Aircraft Replacements Costs: The PHMSA has valued replacement aircraft at current list prices posted by Boeing but airlines do not pay list price. They pay a discounted price based on lengthy negotiations The FAA has a well developed methodology for estimating replacement cost of all categories of commercial airplanes. Moreover, the FAA has utilized this methodology in its regulatory benefits-cost analyses. The most recent FAA manual for determining replacement costs was updated in 2007.[15] CAC/TranSystems does not agree that the B777-200ER represents the average size of passenger aircraft, or that the B777 freighter represents the average size of all-cargo aircraft. Both are too large. However, assuming these planes are used in the analysis, the FAA reports that the market-based replacement costs of a twin-engine wide body passenger aircraft (like the B777-200ER) is $42.3 million; and the corresponding cost of a twin-engine wide body freighter (like the B777) is $23.0 million.[16] The new aircraft prices of $225 million and $254 million are not appropriate for this analysis.

(b) The probability of catastrophic loss based on historical accident/incident data is mathematically close to zero. It is possible to impute a probability of occurrence based on intuitive judgment so long as it does not stray too far from known historical reality.

[15] FAA, Economic Values For FAA, Investment and Regulatory Decisions, A Guide, October 3, 2007.
[16] Ibid., page 5-3.

For the limited purpose of this notional set of calculations, CAC/TranSystems believes it would be conservative to impute a 5% probability of occurrence for a catastrophic event over the next ten years. This assumes there is a 5% probability of a catastrophic aircraft accident during the next 10 years due to lithium ion batteries, when none have occurred in the past. This is a conservative assumption. It should also be noted that in its recent crew training benefit-cost analysis, the FAA found that 75% of aircraft accidents do not involve the loss of life. Twenty-five percent (25%) involve one or more deaths, but not necessarily total loss of life.[17]

(c) PHMSA's estimate of catastrophic loss for a passenger aircraft is $868.8 million, while the corresponding freighter aircraft loss is $265.5 million. The primary difference is due to the assumed number of human lives lost in each incident. However, the vast majority of the lithium ion battery traffic moves on freighter aircraft. In fact, the list of 17 relevant lithium ion battery incidents (Exhibit 4-1) shows 16 freighter aircraft incidents and one passenger incident over the 1998 – 2009 period. Consequently to arrive at single point estimate of the benefit-cost ratio, it is reasonable to weight the prospective costs 16:1 and thereby derive a single "expected value."

(d) For the limited purpose of displaying a range of benefit-cost ratios, PHMSA assumed that its hypothetical catastrophic event (with 100% loss of life) occurs in either the first or the 10th future years. A point estimate could have been obtained by assuming the mid-point (year 5) in the future 10-year period.

[17] See FAA Draft Regulatory Evaluation, Initial Regulatory Flexibility Determination, International Trade Impact Assessment and Unfunded Mandates Assessments, May 2008, page 5. The FAA's list of 169 accidents and costs is reproduced in Exhibit 4-4.

4.4.2 The Expected Value of Benefits from Reducing the Probability of an Aircraft Crash is $1.4 Million

CAC/TranSystems has incorporated the adjustment factors described in section 4.4.1 above into an expected value analysis of the cost of an aircraft accident. This is shown step by step in Exhibit 4-5. When the corrections to PHMSA's analysis are made, and the likelihood of a freighter loss versus a passenger aircraft loss is imputed, one can derive a single point estimate. It is clear that PHMSA's speculative proposition, which has no empirical basis whatsoever, vastly overstates the risk of loss from an aircraft accident as well as the amount of dollar loss by many orders of magnitude. PHMSA's hypothetical calculations show a loss ranging from $135.0 million to $868.8 million. Using corrected data, realistic estimates, and probabilities of occurrences, CAC/TranSystems' single point estimate of the loss from an aircraft accident is <u>$1.4 million</u>, not $135.0 to $868.8 million.[18] This is the maximum benefit that could be ascribed to the proposed new rule and this assumes that the probability of accident prevention due to the rule is 100%. This latter assumption is, itself, not plausible. To be strictly correct, the analysis should further impute a probability of success. Something on the order of 50% would seem reasonable, and then the final benefits estimate would decline from $1.4 million to <u>$0.7 million</u>. With tens of thousands of people who would have to pack and document perfectly for every shipment in order to achieve a close to a 100% safety outcome, a 50% success probability is a reasonable assumption.

[18] See PHMSA Benefit-Cost Report, Table 3-4B, Page 20.

4.5 The Net Present Value of Benefits from Avoiding Fires and Potential Aircraft Accidents Is At Most $1.4 Million

Assuming the proposed rule would be 100% effective in eliminating damage from fires and potential catastrophic loss caused by lithium ion batteries, the maximum NPV of benefits is estimated by CAC/TranSystems as follows:

(a)	NPV of fire damage @ $1,000 per year for 10 years[19]	= $7,000[20]
(b)	NPV of hypothetical aircraft crash[21]	= 1,400,000
(c)	Total (assuming 100% effectiveness)	= 1,407,000

This is the maximum benefit possible from the rulemaking proposal. As with most new safety procedures that rely upon changed behavior and perfect adherence to new rules, the system will always be vulnerable to human error, oversight, and carelessness. Therefore, the PHMSA's assumption of 100% effectiveness will not be achieved, and it is for this reason that CAC/TranSystems characterizes the potential $1.4 million benefits as a maximum possible outcome. Furthermore, with no historical aircraft accidents it is not rational to assume anything about a future catastrophic loss.

4.6 There Would Be Enormous Societal and Industry Disbenefits Occasioned by the Proposed Rulemaking

In benefit-cost analyses where negative societal or third party impacts are present and identifiable, it is often preferable to treat these items as disbenefits (negative benefits) rather than costs. The amounts of economic impact are the same, it is simply a matter of whether or not it is more appropriate to treat them as a deduction from the estimated benefits rather than an addition to the estimated costs of the initiative at issue.

[19] Discounted at 7% per year.
[20] For all lithium batteries the benefit would be $11,200, which is 1,600/1,000 x $7,000.
[21] Exhibit 4-5.

The CAC/TranSystems research and analysis has identified several significant disbenefits that would result from implementing the proposed rule.

4.6.1 U.S. Foreign Trade Will Be Impacted Negatively

Due to major disruption of the supply chains of PRBA members, coupled with the significant increase in their costs of doing business, all of which need to be passed on to the ultimate consumer, the final prices of goods will increase and the volume of goods sold (demand) will decline. Cost/price benefits will be conferred upon foreign manufacturers and distributors that will remain largely un-impacted by the new rules. As a consequence, U.S. exports will decline and U.S. imports will increase. This will further exacerbate the U.S. balance of payments, and tens of thousands of U.S. jobs in high technology, transportation, and distribution will be lost.

4.6.2 Traffic, Revenue, Profits and Employment Will Be Diverted From U.S. to Foreign Flag Airlines

The PHMSA proposal would affect nearly all lithium batteries carried on U.S. registered aircraft anywhere in the world. The major lanes of traffic flow are Asia to the U.S., Asia to Europe, Intra-Asia, and U.S. to Latin America/Canada. Since major U.S. airlines like FedEx and UPS are very significant participants in all traffic flow sectors, it is extremely likely that shippers will divert their foreign-to-foreign traffic to foreign flag airlines wherever possible to avoid the Class 9 hazmat packaging, handling, and transportation costs. U.S. passenger airlines will be impacted as well.

The result will be diversion of traffic to foreign flag carriers with the loss of significant revenue, traffic support for newly emerging cargo hubs in China and elsewhere, and U.S. airline profitability. The volume of impacted traffic is potentially so significant that it will cause reductions of U.S. flag capacity and a resultant loss of pilot jobs along with ground handling and trucking employment by U.S carriers.

4.6.3 Supply Chain Disruption Will Cause Massive Diversion to Canada and Mexico

Major PRBA members with highly sophisticated supply chains that move enormous volumes of batteries, and products with batteries, are conducting studies to redesign their distribution systems in North America. If the PHMSA rule is implemented, distribution centers will be closed in the U.S.; replacement centers will be opened in Canada and Mexico; air traffic inbound from Asia will land in Canada and/or Mexico; and the U.S. markets will be served by trucks from the new distribution centers across the border.

This level of re-design of the distribution systems will add cost and delivery time to the final consumer. It will cause the loss of many thousands of jobs in the U.S. and provide new employment for Canadians and Mexicans.

5.0 THE PROPOSED RULE OFFERS LESS THAN ONE CENT OF BENEFITS PER DOLLAR OF COSTS IN ADDITION TO SERIOUS CONSEQUENCES FOR THE U.S. ECONOMY

The PHMSA cost-benefit analysis significantly overstates the benefits and materially understates the costs of its proposed rule. Its report suggests a benefit-cost ratio of 1.07 to 1.00, which barely crosses the necessary threshold of 1.00 to 1.00. Assuming an unjustified catastrophic aircraft loss, the ratio would increase to a minimum of 1.92 to 1.00 up to a maximum of 9.30 to 1.00, depending on when the loss would occur and what type of aircraft.

It is unclear as to why the PHMSA presented this array of benefit-cost ratios without indicating the true estimate as it should have done and alternatives based on reasonable assumptions – not a speculative catastrophic loss with no statistical basis. As described in Section 4, the benefits should have been estimated assuming a reasonable probability of those benefits being realized.

It is therefore difficult to compare the CAC/TranSystems results with the various PHMSA benefit-cost ratios. To put the values on a common basis, a point estimate $228.2 million was derived as described in Table 5-1 inclusive of the damage-based benefits. The resulting benefit-cost ratio is 3.23 to 1.00.

Table 5-1

The Benefit-Cost Ratio for PHMSA's Rule is Less Than One Cent per Dollar of Cost

(Thousands of Current or NPV Dollars)

		10-Year NPV @ 7% Discount			
	Base Year	Without Catastrophic Loss		With Catastrophic Loss	
A. BENEFITS					
PHMSA Estimate	$10,000	$75,150	1/	$228,207	2/
CAC/TranSystems	$1	$7		$1,407	
B. COSTS					
PHMSA Estimate	$9,390	$70,560		$70,560	
CAC/TranSystems					
PHMSA corrections	$25,521	$191,798		$191,798	
With Cost Impact Model	$1,117,686	$8,399,672		$8,399,672	
C. BENEFIT-COST RATIOS					
PHMSA	1.07	1.07		3.23	
CAC/TranSystems					
PHMSA corrections	< 0.001 to 1.00	< 0.001 to 1.00		0.01	
With Cost Impact Model	< 0.001 to 1.00	< 0.001 to 1.00		< 0.001 to 1.00	

1/ From PHMSA, Cost-Benefit Analysis, December, 2009, Page 20, Table 3-4A.

2/ Ibid, Page 20. This is the sum of (1) the weighted average of PHMSA'a claimed 10-year catastrophic loss NPV (@7%) of a passenger aircraft loss ($441.65 million) with a weight of 1, and a cargo aircraft loss ($135.02 million) with a weight of 16; and (2) the 10-year claimed damages savings NPV (@7%) of $75.15 million. The relevant PHMSA numbers are shown in its's Cost-Benefit Analysis report on tables 3-4A and 3-4B.

The CAC/TranSystems analysis is far more complete in terms of its empirical research, shipper survey, and breadth of impacted logistics activities and costs. As summarized in Exhibits 5-1 and 5-2, the net present value of benefits (at a 7% discount rate) is $1.39 million compared to $8.5 billion of costs, for a ratio of less than 0.0001 to 1.00. The difference between costs and benefits is even greater if a minimal amount of growth (5% per year) is assumed for trade activity. In that case, the estimated costs' net present value increases to $10.4 billion over 10 years, compared to just $1.7 million of benefits. Even with minor corrections to the PHMSA cost estimates (and assuming the corrected CAC/TranSystems benefits), the benefit-cost ratio is only 0.01 to 1.00.

APPENDIX A

PRBA Industry Survey on NPRM Concerning Lithium Battery Transportation (**CONFIDENTIAL)**

Company: _______________________________ Final Product Category: _________________________

Instructions

The attached survey form is designed to collect information on how the proposed PHMSA rule will affect the cost and efficiency of transportation of lithium ion batteries or any products/components containing those batteries. Section A provides an overview of your supply chain that would be affected by the rule. Section B deals with impacts as they specifically apply to a particular trade flow as defined by product/component and trade lane and may require multiple forms (e.g., one for battery transport and one for final product transport). Section C information will be used to make the point that the rule will be impacting highly sophisticated and well-optimized supply chains that are essential to major U.S. manufacturers, consumer product retailers/wholesalers and, ultimately, their customers. Section D solicits information that can be used in the revised estimate of cost impacts.

All responses will be treated as confidential and will not be associated with a particular company or used to reveal actual volumes or sensitive information.

The following describes the general scope of the analysis:

Affected Trade Flows

- Shipments of the following products or components containing lithium ion batteries:
  - Cells
  - Battery Packs
  - Products packed with unattached battery
  - Product with battery included (with rating >3.7 watt-hours)
- Impacts by Trade Flow Types
  - Imports to U.S.
    - Require UN-spec outer packaging for cells, packs or products with unattached batteries
    - Waterproof outer packaging for products with battery included
    - Class 9 handling for all types of shipments on all airlines
    - Ocean/surface shipments marked to prevent air transit
  - U.S. Domestic Air (or Export)
    - Hazmat training
    - Class 9 handling for shipments on all airlines
  - U.S. Domestic Ground
    - Hazmat training
  - Foreign-to-Foreign
    - Require UN-spec outer packaging and Class 9 handling for shipments on all U.S. airlines (including FedEx and UPS) or airlines using U.S.-registered aircraft
    - Ocean/surface or non-U.S. air shipments marked to prevent U.S. aircraft transit

A. Overview of Supply Chain Sectors Affected by NRPM

Final Product: Cellphones ____ Notebooks ____ Battery Packs ____ Cells ____

Other (specify) ____

1. Please identify the volume and average shipment characteristics for air traffic affected by the rule (repeat for multiple final products). and

	Cells	Battery Packs	Product and Battery Separated	Product including Battery
Annual Units via Air*				
Average Pounds/Unit				
Average Units/Shipment				
U.S. Air Imports				
% To Dist. Center	%	%	%	%
% To Distributors	%	%	%	%
% To Retailers	%	%	%	%
Ratio Ocean to Air	%	%	%	%
U.S. Air Domestic				
% To End-User	%	%	%	%
% To Dist. Center	%	%	%	%
% To Distributors	%	%	%	%
% To Retailers	%	%	%	%
Ratio Surface to Air				
U.S. Air Exports	%	%	%	%
Imports, Domestic & Exports Combined	100%	100%	100%	100%
Foreign-to-Foreign Air Trade				
Annual Units via Air**				
% via U.S. Airlines***				
Inbound Shipments from Retail Customers(returns or repairs)				
Annual Units via Air*				

* Provide share of world market if unit volumes are not available. Complete Section B for each column shown with traffic volumes.
** Provide as ratio to U.S. destination shipments if unit volumes are not available.
*** Share of air trade between foreign points moving on aircraft registered in the U.S.

2. Please provide a description or graphical design of your supply chain that will be affected by the rule.

B. Trade/Traffic Routing Patterns for Lithium Ion Components and Projects

Please describe the likely impacts (with a focus on unit cost increases) of the proposed rule (one sheet for each affected air trade flow, e.g., battery pack imports to U.S.)

1. Product/Component:

2. Origin/Destination Routings

3. Impact on Air Packaging, Marking & Documentation Percent Affected by Rule
(Estimate direct cost impact of UN-spec and/or waterproof package on a unit basis)

DOT estimated an increase of $1.25-$1.50 per outer package but assumed an increase from 24 units to 250 units per package (for an unspecified product). Is this reasonable and is it possible to substantially increase your unit shipment size? DOT also estimated an additional 30 seconds for shipment for documentation.

Percent of Air Volumes Affected _______% Shipment Unit _______________

Current Cost _____ /unit Projected Cost _____ /unit Net Cost Increase _____ /unit

Comment____
____
____
____
____

4. Impact on Air Transport Costs and Service Levels
(Estimate net increase in air transport costs (Class 9 premium) and transit time for hazmat handling as applies to delivered final product including all segments of distribution chain.)

DOT did not assign any cost impact for either shipping as Class 9 or from increased handling costs for air carriers (estimate either impact plus any impact of final product delivery time).

Percent of Air Volumes Affected _______% Unit _____________ Net Cost Increase _____ /unit

Net Increase in Product Delivery Time _____ Days

Other Impacts including reduced routing options and rate competition :
____
____
____
____
____

____

5. Impact on Training of In-House Personnel
(Estimate cost impact of compliance with requirement for hazmat training of personnel packing and/or handling these products).

DOT assumed about $10 per employee per year but did specify which employees would be covered.

# of Employees______________________Training Costs per Employee______________________________

Comments____

6. Impact on Downstream Customers (Distributors/Wholesalers/Retailers/End-Users)
(Describe impact on training required for re-packaging or handling of affected products by your customers including returned products from end-users. Describe any other impacts on these parties.)

7. Impact on Supply Chain Design/Efficiency and Total Logistics Costs
(Describe the expected impact of cost/transit time impacts on your overall supply chain including the movement of production/distribution facilities particularly to international points.)

8. Impact on Surface Traffic
(Describe the likely effect of air-related impacts on surface traffic in order to conform packaging and handling methods. If possible, describe as a ratio to air impacts.)

____

D. Scope and Scale of Logistics System

Please provide any quantitative measures that can be used to describe the scope or scale of your distribution operations that will be disrupted or complicated by this rule. For example, "air logistics costs amount to $xxx million per year and account for xx% of final product cost" or "our supply chain handles xxx million shipments per year or services xx customers each with distinct needs".

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E. Other

1. Can you provide any industry-wide studies/statistics that measure the size of the affected market?

2. Can you (or have you) measured the cost and other impacts of the rule using internal supply chain planning tools?

3. Are your operations as described in Sections A and B representative of the industry?

4. Do you have any standard measures or methods that can be used to measure the impact of cost or delivery time increases on overall sales or product value?

5. What are your total annual payments (e.g CY 2009) to U.S.-flag airlines for transportation of the products subject to the proposed rule $_________? How much of this will be transferred to foreign-flag airlines if the proposed rule is adopted $__________?

SUPPORTING EXHIBITS

COST IMPACT CALCULATIONS DEVELOPED BY PHMSA

1. Affected Volumes of Lithium Batteries and Products (millions)	
All BatteryTypes via All Modes	3,300
Lithium Ion Share of Total	80%
Lithium Ion Batteries via All Modes	2,640
Cellphone/Notebook Share of Total	75%
Lithium Ion Batteries for Cellphones/Notebooks via All Modes	1,980
Air Share of Total	20%
Lithium Ion Batteries for Cellphones/Notebooks via Air	396
As Rounded by PHSMA	400

	Status Quo		With Rule	
2. PHMSA Assumed Packaging Impacts	Excepted	Non-Excd.	Low-Cost	High-Cost
Average Units per Package	24	200	250	200
Annual Packages (million)	16.67	2	1.6	2
Inner Package ($ per unit)	$0.012	$0.080	$0.012	$0.080
Outer Package ($ per unit)	$0.500	$0.500	$1.750	$2.000
Packaging Cost ($)				
Inner Package	$4,800,000	$32,000,000	$4,800,000	$32,000,000
Outer Package	$8,335,000	$1,000,000	$2,800,000	$4,000,000
	$13,135,000	$33,000,000	$7,600,000	$36,000,000
Excepted/Non-Excepted Distribution	100%	0%	50%	50%
Weighted Average Annual Costs		$13,135,000		$21,800,000
Net Impact				$8,665,000
PHMSA Annual Costs Adjusted by CAC/TranSystems (Based on Outer Package Only)			$29,172,500	$33,340,000
Adjusted Net Impact for Outer Packages				$22,921,250
Assuming Annual Volume of 214 million units				$280,923,001

COST IMPACT CALCULATIONS DEVELOPED BY PHMSA

3. PHMSA Assumed Training Costs	PHMSA	Corrected for Math Error
Number of Employees	22,174	22,174
Average Hourly Wage ($) - Trainees	$21.17	$21.17
Length of Training Class (hours)	1	5
Training Costs - Trainees ($)	$469,424	$2,347,118
Average Employees per Class	27	27
Number of Classes	821	821
Average Hourly Wage ($) - Instructor	$50.00	$50.00
Length of Training Class (hours)	5	5
Training Costs - Instructors (mil. $)	$205,315	$205,315
Training Costs - Total (mil. $)	$674,738	$2,552,433

4. Information Collection Costs	
Design Documentation	
Number of Lithium Battery Manufacturers	110
Average Designs per Manufacturer	10
Lithium Battery Designs	1,100
Average Time for Documentation (hours)	0.5
Annual Hours for Documentation	550
Average Hourly Wage ($)	$25.00
	$13,750
Package Documentation	
Average Packages per Shipment	100
Annual Shipments	166,700
Average Time for Documentation (minutes)	0.5
Annual Hours for Documentation	1,389
Average Hourly Wage ($)	$25.00
	$34,729

COST IMPACT CALCULATIONS DEVELOPED BY PHMSA

5. Total Costs by Year (PHMSA Version)

	Packaging	Training	Information	Total
Year 1	$8,670,000	$670,000	$50,000	$9,390,000
Year 2	$8,670,000	$670,000	$50,000	$9,390,000
Year 3	$8,670,000	$670,000	$50,000	$9,390,000
Year 4	$8,670,000	$670,000	$50,000	$9,390,000
Year 5	$8,670,000	$670,000	$50,000	$9,390,000
Year 6	$8,670,000	$670,000	$50,000	$9,390,000
Year 7	$8,670,000	$670,000	$50,000	$9,390,000
Year 8	$8,670,000	$670,000	$50,000	$9,390,000
Year 9	$8,670,000	$670,000	$50,000	$9,390,000
Year 10	$8,670,000	$670,000	$50,000	$9,390,000
10-Year Present Value at 3% Discount Rate	$76,180,000	$5,890,000	$440,000	$82,500,000
10-Year Present Value at 7% Discount Rate	$65,160,000	$5,040,000	$380,000	$70,570,000

6. Total Costs by Year (Corrected)

	Packaging	Training	Information	Total
Year 1	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 2	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 3	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 4	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 5	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 6	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 7	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 8	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 9	$22,921,250	$2,550,000	$50,000	$25,521,250
Year 10	$22,921,250	$2,550,000	$50,000	$25,521,250
10-Year Present Value at 3% Discount Rate	$201,390,000	$22,400,000	$440,000	$224,230,000
10-Year Present Value at 7% Discount Rate	$172,260,000	$19,160,000	$380,000	$191,800,000

Corrected Difference	
at 3% Discount Rate	$141,730,000
at 7% Discount Rate	$121,230,000

Employment in Transportation and Material Moving Occupations for Selected Affected Industries

Industry (NAICS Code)	Employment
Commercial and Service Industry Machinery Manufacturing (333300)	2,680
Other General Purpose Machinery Manufacturing (333900)	10,610
Computer and Peripheral Equipment Manufacturing (334100)	2,310
Communications Equipment Manufacturing (334200)	2,150
Audio and Video Equipment Manufacturing (334300)	910
Semiconductor and Other Electronic Component Manufacturing (334400)	6,130
Navigational Measuring Electromedical and Control Instruments Manufacturing (334500)	6,870
Electrical Equipment Appliance and Component Manufacturing (335000)	21,890
Other Electrical Equipment and Component Manufacturing (335900)	7,040
	60,590
Professional and Commercial Equipment and Supplies Merchant Wholesalers (423400)	41,680
Electrical and Electronic Goods Merchant Wholesalers (423600)	31,690
Electronics and Appliance Stores (443000)	20,080
General Merchandise Stores (452000)	160,090
Electronic Shopping and Mail-Order Houses (454100)	22,000
	275,540
Support Activities for Air Transportation (488100)	42,010
Freight Transportation Arrangement (488500)	38,000
Other Support Activities for Transportation (488900)	17,510
Warehousing and Storage (493000)	394,830
	492,350
	828,480

Source: Bureau of Labor Statistics, LS, Occupational Employment Statistics (OES) - May 2008

U.S. IMPORTS OF LITHIUM ION BATTERIES AND RELATED PRODUCTS

	2009 Trade via All Modes					2009 Trade via Air										
	Value (Million $)	Units (millions)	$ per Unit	Shipments (000)	Units per Shipment	Value (Million $)	% of Total	Weight (000 MT)	Kilograms per Unit 1/	$ per Unit	Units (millions) 1/	% of Total	Units per Shipment 2/	Shipments (000) 2/	% of Total	Kilograms/ Shipment
1. U.S. IMPORTS																
Cellphones & Related Products	$48,704	324.2	$150	524.6	618	$37,542	77%	119.2	0.55	$172	218.6	67%	628	348.0	66%	342
Notebook and Handheld Computers	$26,915	47.1	$572	267.5	176	$23,321	87%	146.1	3.84	$613	38.1	81%	148	256.7	96%	569
Audio & Video Equipment	$16,236	177.6	$91	142.0	1,251	$9,041	56%	53.0	0.53	$91	99.6	56%	842	118.3	83%	448
Hand Power Tools	$1,753	37.3	$47	45.5	821	$53	3%	1.3	1.90	$78	0.7	2%	166	4.1	9%	317
Other Electronic Products	$5,791	198.5	$29	152.1	1,305	$2,633	45%	19.3	0.63	$85	30.8	16%	294	104.9	69%	184
Combined Total	$99,399	784.7	$127	1,131.6	693	$72,590	73%	339.0	0.87	$187	387.7	49%	466	832.0	74%	407
Lithium Ion Batteries	$702	67.5	$10	25.1	2,694	$507	72%	10.1	0.22	$11	46.8	69%	2,567	18.2	73%	553
2. U.S. RE-EXPORTS																
Cellphones & Related Products	$5,580	38.2	$146	135.3	282	$3,732	67%	11.7	1.40	$444	8.4	22%	80	105.2	78%	112
Notebook and Handheld Computers	$2,693	3.7	$732	57.3	64	$1,584	59%	7.8	3.68	$750	2.1	57%	50	42.3	74%	184
Audio & Video Equipment	$923	7.7	$120	32.8	234	$590	64%	2.6	0.68	$157	3.8	49%	205	18.3	56%	140
Hand Power Tools	$56	0.6	$100	3.5	159	$3	5%	0.3	5.23	$51	0.1	9%	93	0.5	15%	489
Other Electronic Products	$1,123	6.6	$171	40.2	164	$620	55%	3.9	2.34	$375	1.7	25%	61	27.1	67%	143
Combined Total	$10,375	56.7	$183	269.1	211	$6,529	63%	26.2	1.64	$409	16.0	28%	83	193.4	72%	135
3. U.S. EXPORTS																
Cellphones & Related Products	$6,600	65.3	$101	149.3	437	$5,482	83%	15.6	1.40	$491	11.2	17%	80	139.9	94%	112
Notebook and Handheld Computers	$1,418	2.8	$501	44.2	64	$1,166	82%	8.2	3.68	$523	2.2	79%	50	44.6	101%	184
Audio & Video Equipment	$755	3.7	$202	23.2	161	$564	75%	2.6	0.68	$146	3.9	103%	205	18.8	81%	140
Hand Power Tools	$48	0.4	$106	2.4	190	$10	21%	0.3	5.23	$182	0.1	12%	93	0.6	24%	489
Other Electronic Products	$1,967	7.4	$264	70.9	105	$1,373	70%	8.3	2.34	$386	3.6	48%	61	58.4	82%	143
Combined Total	$10,788	79.7	$135	290.0	275	$8,595	80%	35.1	1.68	$412	20.9	26%	80	262.3	90%	134
4. TOTAL TRADE																
Cellphones & Related Products	$60,885	427.7	$142	809.2	529	$46,756	77%	146.6	0.62	$196	238.1	56%	401	593.1	73%	247
Notebook and Handheld Computers	$31,025	53.6	$579	369.0	145	$26,071	84%	162.1	3.82	$615	42.4	79%	123	343.6	93%	472
Audio & Video Equipment	$17,914	189.0	$95	198.0	955	$10,195	57%	58.2	0.54	$95	107.2	57%	690	155.4	78%	375
Hand Power Tools	$1,857	38.3	$48	51.3	747	$65	4%	1.8	2.35	$84	0.8	2%	151	5.2	10%	354
Other Electronic Products	$8,882	212.5	$42	263.1	808	$4,626	52%	31.5	0.88	$128	36.0	17%	189	190.4	72%	166
Lithium Ion Batteries	$702	67.5	$10	25.1	2,694	$507	72%	10.1	0.22	$11	46.8	69%	2,567	18.2	73%	553
Combined Total	$121,264	988.7	$123	1,715.7	576	$88,221	73%	410.3	0.87	$187	471.4	48%	361	1,305.9	76%	314

1/ Total units estimated based on air weight and average unit weight (Exhibit 3-5) to a maximum share of units by all modes based on the higher of (1) the air share of total value or (2) 90%
2/ Total shipments estimated based on total units and average units per shipment (Exhibit 3-5) to a maximum share of shipments by all modes based on the higher of (1) the air share of total value or (2) 90%

Source: Exhibits 3-4 and 3-5

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
I-1 IMPORTS FROM OVERSEAS											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$25,267	109.8	$230,114	175.4	$144	1,597	$24,932	99%	70.0	$356
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$580	9.7	$60,098	9.7	$60	1,003	$564	97%	2.6	$214
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$11,225	266.3	$42,157	-	N/A	-	$8,928	80%	39.1	$228
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$262	10.2	$25,623	4.1	$64	401	$175	67%	1.2	$141
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$354	9.0	$39,205	-	N/A	-	$232	66%	1.5	$152
		$37,689	405.0	$93,061	273.1	$138	674	$34,831	92%	114.5	$304
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$26,609	258.7	$102,865	46.7	$570	180	$23,280	87%	146.1	$159
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$2,940	34.4	$85,542	41.3	$71	1,202	$1,029	35%	4.7	$217
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$556	2.6	$217,405	7.5	$74	2,938	$86	15%	2.5	$34
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$4,991	37.5	$133,051	47.5	$105	1,267	$4,292	86%	27.3	$157
8525805020	CAMCORDERS EXCEPT 8MM	$1,052	8.9	$118,410	5.2	$202	587	$876	83%	4.3	$206
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$433	7.2	$60,254	18.9	$23	2,636	$383	88%	1.3	$288
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$2,747	35.0	$78,379	28.4	$97	811	$2,136	78%	6.9	$310
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$2,959	10.2	$290,317	25.5	$116	2,499	$216	7%	5.9	$37
		$15,678	135.7	$115,495	174.4	$90	1,285	$9,017	58%	52.9	$170
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$306	6.1	$49,970	6.7	$46	1,087	$2	1%	0.1	$19
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$188	5.2	$36,251	4.0	$47	779	$1	0%	0.0	$19
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$178	5.8	$30,762	4.1	$44	705	$18	10%	0.2	$88
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$177	5.8	$30,311	5.2	$34	886	$22	13%	0.6	$37
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$162	4.6	$34,829	4.8	$33	1,044	$3	2%	0.1	$29
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$164	4.3	$38,278	3.4	$48	791	$1	0%	0.1	$8
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$83	2.8	$30,199	1.3	$66	455	$2	2%	0.1	$26
8467220090	ELECTRIC HAND SAWS, NESOI	$48	1.5	$32,310	0.7	$64	502	$1	3%	0.0	$53
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$41	1.3	$30,399	0.2	$165	184	$1	1%	0.0	$29
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$21	0.9	$22,781	0.9	$23	1,012	$2	11%	0.0	$63
		$1,366	38.3	$35,657	31.3	$44	817	$53	4%	1.3	$41
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$1,552	14.8	$104,770	2.1	$745	141	$772	50%	8.7	$89
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$998	38.2	$26,096	-	N/A	-	$699	70%	3.0	$234
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$842	8.2	$103,297	21.9	$39	2,683	$264	31%	1.6	$166
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$457	11.3	$40,351	18.0	$25	1,593	$229	50%	1.4	$165
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$403	13.8	$29,151	13.5	$30	974	$274	68%	1.4	$198
8510100000	ELECTRIC SHAVERS	$233	2.8	$84,584	22.6	$10	8,191	$60	26%	0.7	$88
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$168	14.1	$11,894	42.5	$4	3,004	$72	43%	0.5	$143
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$163	6.3	$25,840	-	N/A	-	$108	66%	0.8	$132
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$127	7.1	$17,989	19.3	$7	2,740	$4	3%	0.5	$8
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$48	2.8	$17,440	4.0	$12	1,438	$16	34%	0.2	$77
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$16	0.5	$33,850	3.7	$4	7,812	$1	8%	0.0	$30
		$5,008	119.8	$41,784	192.1	$26	1,603	$2,500	50%	18.8	$133
All Electronic Commodities		$86,350	957.6	$90,176	717.5	$120	749	$66,357	77%	333.6	$199

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
I-2 IMPORTS FROM MEXICO											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$6,216	12.5	$498,271	30.5	$204	2,446	$1,210	19%	2.5	$479
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$467	2.1	$221,877	2.0	$234	947	$431	92%	0.8	$531
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$2,747	80.9	$33,958	-	N/A	-	$569	21%	0.9	$623
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$10	0.3	$32,266	0.0	$314	103	$0	2%	0.0	$362
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$12	0.8	$15,817	-	N/A	-	$1	7%	0.0	$293
		$9,454	96.6	$97,871	46.0	$206	476	$2,210	23%	4.3	$520
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$266	6.2	$43,115	0.4	$676	64	$12	5%	0.0	$487
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$67	0.9	$76,393	0.2	$319	239	$5	8%	0.0	$479
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$3	0.0	$102,380	0.0	$147	698	$0	3%	0.0	$32
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$1	0.1	$8,065	0.0	$294	27	$0	12%	0.0	$99
8525805020	CAMCORDERS EXCEPT 8MM	$0	0.0	$6,748	0.0	$843	8	$0	26%	0.0	$645
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$0	0.0	$25,144	0.0	$86	291	$0	24%	0.0	$197
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	0.0	$4,644	0.0	$97	48	$0	18%	0.0	$79
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$431	1.8	$244,426	2.9	$150	1,633	$0	0%	0.0	$41
		$502	2.8	$180,518	3.1	$161	1,121	$6	1%	0.0	$271
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$86	1.0	$85,195	1.0	$86	989	$0	0%	0.0	$488
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$68	1.3	$53,510	0.7	$96	556	$0	0%	0.0	$450
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$63	1.0	$61,399	0.6	$101	606	$0	0%	0.0	$25
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$78	1.7	$44,402	2.9	$27	1,663	$0	0%	0.0	$732
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$30	0.6	$50,733	0.2	$171	298	$0	0%	0.0	$246
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$8	0.5	$18,716	0.1	$86	217	$0	0%	-	$0
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$50	0.8	$59,993	0.5	$106	569	$0	0%	0.0	$26
8467220090	ELECTRIC HAND SAWS, NESOI	$0	0.0	$10,132	0.0	$90	113	$0	0%	-	$0
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	0.0	$11,168	0.0	$254	44	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$2	0.1	$31,407	0.0	$85	369	$0	0%	-	$0
		$386	7.0	$54,772	6.0	$64	853	$0	0%	0.0	$187
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$308	3.1	$98,576	0.5	$649	152	$1	0%	0.0	$161
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$52	3.8	$13,632	-	N/A	-	$2	5%	0.0	$124
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$15	0.3	$47,309	0.1	$226	209	$1	4%	0.0	$381
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$1	0.0	$27,649	0.0	$69	402	$0	18%	0.0	$127
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$75	7.6	$9,820	1.3	$55	178	$4	6%	0.0	$239
8510100000	ELECTRIC SHAVERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$26	2.5	$10,593	2.8	$9	1,132	$0	2%	0.0	$189
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$29	0.2	$172,846	-	N/A	-	$0	1%	0.0	$96
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$0	0.0	$6,359	0.0	$2,423	3	$0	28%	0.0	$170
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$505	17.5	$28,830	5.6	$90	321	$9	2%	0.1	$175
All Electronic Commodities		$11,113	130.1	$85,407	61.1	$182	470	$2,238	20%	4.4	$514

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

I-3 IMPORTS FROM CANADA

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$980	3.2	$309,145	3.3	$300	1,031	$252	26%	0.2	$1,609
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$51	0.5	$97,290	0.2	$327	298	$46	90%	0.0	$1,908
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$437	17.1	$25,526	-	N/A	-	$162	37%	0.2	$708
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$1	0.0	$49,407	0.0	$619	80	$0	39%	0.0	$395
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$92	2.1	$43,256	-	N/A	-	$39	42%	0.1	$783
		$1,562	23.0	$67,955	5.2	$301	226	$500	32%	0.5	$1,085
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$39	2.6	$14,695	0.0	$1,145	13	$28	73%	0.0	$739
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$30	1.7	$17,949	0.0	$1,493	12	$5	18%	0.0	$311
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	0.0	$10,551	0.0	$821	13	$0	62%	0.0	$31
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$17	1.2	$14,895	0.0	$841	18	$8	49%	0.0	$300
8525805020	CAMCORDERS EXCEPT 8MM	$0	0.0	$8,642	0.0	$638	14	$0	66%	0.0	$410
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$7	0.6	$12,035	0.0	$318	38	$4	52%	0.0	$276
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	0.0	$21,768	0.0	$65	337	$0	5%	0.0	$121
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$1	0.0	$85,361	0.0	$192	445	$0	1%	0.0	$263
		$56	3.5	$15,970	0.1	$808	20	$18	32%	0.1	$292
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$0	0.0	$42,455	0.0	$53	801	$0	0%	-	$0
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$0	0.0	$16,886	0.0	$65	260	$0	0%	-	$0
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$0	0.0	$9,757	0.0	$106	92	$0	24%	0.0	$119
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	0.0	$8,924	0.0	$688	13	$0	16%	0.0	$162
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$0	0.0	$59,807	0.0	$74	804	$0	2%	0.0	$62
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$0	0.0	$6,378	0.0	$165	39	$0	17%	0.0	$72
8467220090	ELECTRIC HAND SAWS, NESOI	$0	0.0	$3,750	0.0	$3,750	1	$0	0%	-	$0
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	0.0	$5,685	0.0	$319	18	$0	0%	-	$0
		$1	0.1	$11,537	0.0	$122	94	$0	11%	0.0	$117
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$55	3.0	$18,436	0.0	$1,992	9	$27	49%	0.0	$594
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$120	6.1	$19,649	-	N/A	-	$46	38%	0.1	$464
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$27	0.6	$41,767	0.0	$892	47	$16	61%	0.0	$1,214
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$1	0.1	$11,227	0.0	$227	49	$1	54%	0.0	$395
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$22	1.5	$14,973	0.1	$159	94	$6	27%	0.0	$412
8510100000	ELECTRIC SHAVERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$12	1.7	$7,192	0.1	$97	74	$9	70%	0.0	$559
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$41	1.7	$24,860	-	N/A	-	$20	48%	0.3	$74
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	0.0	$2,600	0.0	$6	443	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$0	0.1	$9,521	0.0	$2,516	4	$0	50%	0.0	$323
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$279	14.7	$18,958	0.8	$360	53	$124	45%	0.5	$272
All Electronic Commodities		$1,936	43.9	$44,092	6.1	$319	138	$671	35%	1.0	$659

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-1 RE-EXPORTS TO OVERSEAS											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$935	7.8	$120,232	6.1	$154	779	$935	100%	1.9	$487
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$201	3.6	$55,641	2.0	$101	550	$193	96%	0.6	$300
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$2,277	82.5	$27,616	-	N/A	-	$2,221	98%	8.1	$275
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$3,414	93.9	$36,370	24.2	$141	258	$3,349	98%	10.6	$315
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$1,339	33.3	$40,264	2.0	$681	59	$1,242	93%	7.1	$175
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$148	4.0	$37,342	0.7	$198	188	$135	91%	0.4	$312
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$324	8.5	$38,288	2.5	$128	299	$276	85%	1.5	$183
8525805020	CAMCORDERS EXCEPT 8MM	$28	1.3	$22,550	0.0	$637	35	$28	98%	0.1	$244
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$47	2.5	$19,106	0.2	$294	65	$45	95%	0.1	$388
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$547	16.1	$33,897	3.5	$157	216	$483	88%	2.2	$223
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$1	0.1	$6,741	0.0	$79	85	$0	21%	0.0	$6
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$1	0.0	$15,891	0.0	$80	197	$0	12%	0.0	$16
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$2	0.2	$10,290	0.0	$97	106	$1	73%	0.0	$29
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$1	0.1	$11,328	0.0	$58	196	$0	25%	0.1	$3
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$0	0.0	$10,116	0.0	$68	148	$0	11%	0.0	$31
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$1	0.1	$12,428	0.0	$87	143	$0	28%	0.1	$3
8467220090	ELECTRIC HAND SAWS, NESOI	$0	0.0	$24,928	0.0	$112	222	$0	9%	0.0	$13
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$6	0.6	$10,525	0.1	$80	132	$2	37%	0.2	$9
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$150	5.9	$25,445	0.1	$2,064	12	$138	92%	1.1	$125
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$64	2.3	$27,623	0.5	$134	206	$41	64%	0.4	$115
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$26	1.1	$24,616	0.4	$71	345	$25	96%	0.1	$324
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$316	9.6	$32,930	0.9	$365	90	$291	92%	1.6	$183
8510100000	ELECTRIC SHAVERS	$2	0.1	$24,137	0.1	$26	938	$1	45%	0.0	$52
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$9	1.0	$9,147	0.2	$45	204	$8	92%	0.1	$135
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$3	0.4	$8,527	0.0	$242	35	$3	88%	0.0	$141
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	0.0	$10,564	0.0	$21	500	$0	74%	0.0	$30
		$570	20.3	$28,075	2.1	$274	103	$508	89%	3.2	$157
All Electronic Commodities		$5,876	164.1	$35,798	31.8	$185	194	$5,566	95%	23.4	$238

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-2 RE-EXPORTS TO MEXICO											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$688	1.8	$389,771	4.9	$140	2,793	$26	4%	0.1	$371
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$197	0.3	$655,967	0.9	$218	3,009	$1	1%	0.0	$269
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$410	11.4	$35,962	-	N/A	-	$67	16%	0.2	$292
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$1,295	13.5	$96,253	8.5	$152	634	$95	7%	0.3	$310
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$543	12.5	$43,296	0.6	$887	49	$254	47%	0.3	$808
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$61	3.5	$17,509	0.3	$226	78	$30	50%	0.1	$291
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$71	2.0	$36,191	0.6	$110	330	$22	31%	0.1	$209
8525805020	CAMCORDERS EXCEPT 8MM	$15	1.3	$12,254	0.0	$597	21	$3	18%	0.0	$347
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$6	0.3	$19,919	0.0	$125	159	$1	23%	0.0	$379
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$153	7.0	$21,927	1.0	$155	142	$56	37%	0.2	$256
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$0	0.0	$15,041	0.0	$139	108	$0	19%	0.0	$15
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$0	0.0	$6,551	0.0	$78	84	$0	0%	-	$0
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$1	0.1	$7,817	0.0	$130	60	$0	12%	0.0	$11
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$0	0.0	$10,195	0.0	$72	141	$0	1%	0.0	$55
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$1	0.1	$9,095	0.0	$75	121	$0	0%	-	$0
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$0	0.0	$6,878	0.0	$96	71	$0	0%	-	$0
8467220090	ELECTRIC HAND SAWS, NESOI	$0	0.0	$11,120	0.0	$86	129	$0	8%	0.0	$25
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$2	0.2	$8,937	0.0	$93	96	$0	6%	0.0	$13
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$77	2.3	$33,968	0.0	$1,570	22	$40	52%	0.1	$278
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$74	1.2	$62,568	0.8	$93	670	$2	3%	0.0	$141
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$11	1.1	$10,213	0.2	$61	167	$6	57%	0.0	$307
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$16	1.2	$13,411	0.0	$368	36	$3	16%	0.0	$207
8510100000	ELECTRIC SHAVERS	$0	0.0	$12,167	0.0	$15	806	$0	0%	-	$0
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$4	0.2	$16,572	0.3	$14	1,204	$0	4%	0.0	$162
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$1	0.1	$10,793	0.0	$247	44	$0	23%	0.0	$114
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	0.0	$8,251	0.0	$33	249	$0	0%	-	$0
		$183	6.1	$30,187	1.3	$136	223	$52	28%	0.2	$264
All Electronic Commodities		$2,176	39.3	$55,391	11.5	$189	293	$458	21%	1.0	$437

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-3 RE-EXPORTS TO CANADA											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$281	3.3	$85,373	1.8	$153	557	$103	37%	0.2	$681
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$73	0.7	$98,176	0.4	$184	532	$12	16%	0.0	$636
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$518	24.0	$21,595	-	N/A	-	$173	33%	0.6	$271
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$872	28.0	$31,111	5.5	$159	196	$288	33%	0.8	$356
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$811	11.5	$70,488	1.1	$737	96	$88	11%	0.4	$237
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$63	3.8	$16,639	0.2	$265	63	$5	8%	0.0	$203
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$158	5.8	$27,235	3.0	$53	510	$46	29%	0.1	$307
8525805020	CAMCORDERS EXCEPT 8MM	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$222	9.6	$23,039	3.2	$69	333	$51	23%	0.2	$293
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$17	0.4	$41,788	0.2	$104	402	$0	0%	0.0	$8
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$5	0.2	$23,264	0.1	$84	276	$0	0%	-	$0
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$6	0.4	$17,329	0.1	$106	164	$0	1%	0.0	$38
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$3	0.3	$9,837	0.0	$68	145	$0	1%	0.0	$31
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$4	0.3	$15,733	0.1	$70	223	$0	0%	-	$0
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$11	1.0	$11,156	0.1	$168	66	$0	1%	0.0	$50
8467220090	ELECTRIC HAND SAWS, NESOI	$1	0.1	$10,076	0.0	$191	53	$0	1%	0.0	$54
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$48	2.7	$17,806	0.5	$104	171	$0	0%	0.0	$35
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$85	4.1	$20,549	0.1	$650	32	$16	19%	0.2	$92
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$50	1.0	$50,947	0.3	$175	291	$6	13%	0.1	$90
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$79	1.4	$57,594	0.6	$129	446	$25	32%	0.1	$259
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$118	5.5	$21,644	0.2	$504	43	$10	9%	0.1	$121
8510100000	ELECTRIC SHAVERS	$28	0.5	$53,115	1.0	$29	1,857	$0	1%	0.0	$58
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$6	0.9	$6,792	0.8	$8	844	$1	21%	0.0	$255
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$2	0.3	$7,023	0.0	$57	123	$1	46%	0.0	$154
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$2	0.1	$26,698	0.1	$32	837	$0	1%	0.0	$29
		$370	13.8	$26,853	3.1	$118	227	$60	16%	0.4	$136
All Electronic Commodities		$2,322	65.6	$35,392	13.4	$173	204	$488	21%	1.8	$271

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-4 EXPORTS TO OVERSEAS											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$650	6.4	$101,814	7.5	$87	1,177	$578	89%	2.3	$253
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$609	7.2	$85,177	5.4	$112	759	$597	98%	2.0	$291
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$4,198	103.4	$40,602	-	N/A	-	$3,969	95%	10.3	$387
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$5,458	116.9	$46,672	56.1	$97	480	$5,145	94%	14.6	$353
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$1,277	36.0	$35,489	2.6	$498	71	$1,118	88%	8.0	$140
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$133	4.8	$27,383	0.3	$444	62	$94	71%	0.6	$156
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$412	9.2	$44,807	2.5	$166	271	$369	90%	1.6	$232
8525805020	CAMCORDERS EXCEPT 8MM	$18	0.6	$27,445	0.0	$513	53	$16	92%	0.1	$176
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$62	2.6	$23,857	0.2	$332	72	$56	90%	0.3	$222
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$625	17.3	$36,127	3.0	$207	174	$535	86%	2.5	$211
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$10	0.3	$32,570	0.1	$116	281	$3	27%	0.1	$52
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$1	0.1	$26,376	0.0	$89	297	$0	33%	0.0	$17
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$4	0.4	$9,880	0.0	$113	87	$3	79%	0.1	$31
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$3	0.3	$12,911	0.0	$90	144	$2	52%	0.0	$39
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$2	0.1	$19,479	0.0	$78	250	$0	18%	0.0	$31
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$1	0.2	$8,350	0.0	$117	71	$0	23%	0.0	$27
8467220090	ELECTRIC HAND SAWS, NESOI	$1	0.1	$7,639	0.0	$136	56	$0	25%	0.0	$52
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$23	1.4	$15,999	0.2	$106	151	$9	40%	0.3	$35
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$653	20.8	$31,339	0.3	$2,291	14	$585	90%	4.5	$130
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$154	5.8	$26,645	0.6	$272	98	$118	77%	0.6	$202
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$28	1.6	$17,185	0.3	$95	181	$20	71%	0.1	$185
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$490	15.9	$30,818	0.5	$931	33	$431	88%	2.2	$197
8510100000	ELECTRIC SHAVERS	$6	0.2	$32,892	0.2	$31	1,064	$3	50%	0.1	$46
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$63	4.8	$13,217	1.1	$58	228	$57	90%	0.2	$253
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$38	2.0	$19,008	0.2	$211	90	$37	98%	0.2	$245
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$11	0.1	$81,530	0.3	$32	2,546	$6	54%	0.1	$82
		$1,443	51.2	$28,158	3.5	$414	68	$1,256	87%	7.9	$160
All Electronic Commodities		$8,825	222.9	$39,595	65.4	$135	293	$8,039	91%	33.3	$242

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-5 EXPORTS TO MEXICO											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$58	0.5	$113,911	0.5	$113	1,010	$13	22%	0.1	$160
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$53	2.1	$25,330	0.4	$132	192	$14	26%	0.0	$307
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$583	11.8	$49,596	-	N/A	-	$82	14%	0.2	$417
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$694	14.4	$48,338	5.7	$121	398	$108	16%	0.3	$338
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$46	2.7	$17,236	0.1	$460	37	$17	37%	0.1	$227
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$24	0.9	$27,904	0.1	$383	73	$2	8%	0.0	$146
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$14	0.4	$36,647	0.2	$85	430	$3	21%	0.0	$201
8525805020	CAMCORDERS EXCEPT 8MM	$1	0.1	$14,810	0.0	$620	24	$0	56%	0.0	$452
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$12	0.5	$24,478	0.1	$108	226	$2	20%	0.0	$338
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$51	1.8	$28,360	0.3	$151	188	$8	15%	0.0	$217
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$4	0.0	$92,943	0.0	$118	791	$0	0%	0.0	$39
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$2	0.0	$154,326	0.0	$235	657	$0	0%	-	$0
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$2	0.1	$20,797	0.0	$159	131	$0	8%	0.0	$45
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$1	0.1	$12,641	0.0	$67	189	$0	0%	0.0	$540
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$0	0.0	$7,100	0.0	$105	68	$0	0%	-	$0
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$1	0.0	$50,239	0.0	$133	377	$0	0%	-	$0
8467220090	ELECTRIC HAND SAWS, NESOI	$0	0.0	$23,071	0.0	$95	244	$0	5%	0.0	$183
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$10	0.3	$36,826	0.1	$129	286	$0	2%	0.0	$47
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$145	1.8	$80,344	0.2	$818	98	$13	9%	0.1	$238
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$116	2.0	$59,295	0.4	$285	208	$4	4%	0.0	$255
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$5	0.2	$23,573	0.1	$71	334	$0	3%	0.0	$173
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$16	0.9	$17,559	0.0	$1,060	17	$5	31%	0.0	$255
8510100000	ELECTRIC SHAVERS	$0	0.0	$9,590	0.0	$23	426	$0	1%	0.0	$74
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$6	0.8	$7,360	0.3	$22	330	$1	21%	0.0	$211
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$2	0.2	$11,312	0.0	$231	49	$1	55%	0.0	$191
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	0.0	$15,394	0.0	$13	1,184	$0	6%	0.0	$12
		$291	6.0	$48,824	1.0	$298	164	$25	9%	0.1	$237
All Electronic Commodities		$1,091	25.0	$43,604	7.2	$151	288	$158	14%	0.5	$292

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
E-6 EXPORTS TO CANADA											
Cellphones & Related Products											
8517120050	CELLULAR RADIOTELEPHONES FOR PCRS	$10	0.8	$12,652	0.1	$125	101	$3	33%	0.0	$352
8517120080	TELEPHONES FOR CELL/OTHER WIRELESS NETWORKS, NESOI	$6	0.6	$9,800	0.0	$136	72	$3	55%	0.0	$581
8517620050	MACH FOR RECP/CONV/REGEN VOICE/IMAGE/DATA. NESOI	$432	16.6	$26,105	-	N/A	-	$222	51%	0.7	$324
8525601030	RADIO TRANSCIEVERS,HAND-HELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525601050	RADIO TRANSCIEVERS, EXC HANDHELD	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$449	18.0	$24,920	3.5	$129	193	$229	51%	0.7	$327
Notebook Computers											
8471300100	PORT DGTL ADP MACH,< 10 KG,AT LEAST CPU,KBRD,DSPLY	$95	5.6	$16,951	0.2	$558	30	$31	33%	0.1	$275
Audio & Video Equipment											
8521900000	VIDEO RECORDING OR REPRODUCING APP,EXC MAGNET TAPE	$31	1.7	$18,023	0.1	$377	48	$5	17%	0.0	$226
8525501000	TV SET TOP BOXES WHICH HAVE A COMMUNICATION FUNCTN	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525804000	DIGITAL STILL IMAGE VIDEO CAMERAS	$49	2.4	$20,107	0.3	$159	126	$16	32%	0.0	$533
8525805020	CAMCORDERS EXCEPT 8MM	$0	-	$0	-	N/A	-	$0	0%	-	$0
8525805050	STILL IMAGE VIDEO CAMERA,VDEO CAMERA RECORDR,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528591500	VIDEO MON,CLR,FLAT PNEL SCR,W/ REC/REP,LT=34.29	$0	-	$0	-	N/A	-	$0	0%	-	$0
8528712000	TV SET TOP BOXES W/ COMMNICTN FUNC, COL,GT 34.29CM	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$80	4.2	$19,233	0.4	$206	93	$21	26%	0.1	$397
Hand Power Tools											
8467210010	ELECTRIC HAND DRILLS, ROTARY, BATTERY POWERED	$1	0.0	$20,281	0.0	$94	216	$0	0%	0.0	$132
8467220070	ELECTRIC HAND SAWS, RECIPROCATING AND JIG TYPES	$1	0.1	$18,165	0.0	$94	193	$0	4%	0.0	$10
8467290040	ELECTRIC HAND SCREWDRIVERS, NUT-RUNNERS, IMPACT WR	$4	0.2	$22,960	0.0	$131	176	$0	3%	0.0	$21
8467290090	OTHER ELECTROMECHANICAL HAND TOOLS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290010	ELECTRIC HAND ANGLE GRINDERS, SANDERS & POLISHERS	$4	0.1	$33,768	0.1	$69	490	$0	1%	0.0	$89
8467220020	ELECTRIC HAND SAWS, CIRCULAR TYPE	$1	0.1	$16,425	0.0	$126	130	$0	2%	0.0	$30
8467210070	ELECTRIC HAND DRILLS OTHER THAN ROTARY	$3	0.1	$23,836	0.0	$92	260	$0	8%	0.0	$35
8467220090	ELECTRIC HAND SAWS, NESOI	$1	0.1	$14,852	0.0	$105	141	$0	3%	0.0	$29
8467290080	ELECTROPNEUMATIC HAND ROTARY & PERCUSSION HAMMERS	$0	-	$0	-	N/A	-	$0	0%	-	$0
8467290035	ELECTRIC HAND GRINDERS, POLISHERS, SANDERS, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
		$14	0.6	$22,420	0.2	$95	236	$0	3%	0.0	$25
Other Electronic Products											
8471490000	UNTS, NESOI, FOR ADP MACH, ENTERED IN FORM OF SYSM	$115	7.4	$15,413	0.1	$829	19	$48	42%	0.2	$247
9031808085	MEASURE/CHECK INST,APPLN&MACHINES,NESOI IN CHAP 90	$0	-	$0	-	N/A	-	$0	0%	-	$0
8517620010	MODEMS OF A KIND USED WITH DATA PRCSG MCH OF 8471	$22	0.9	$24,891	0.1	$147	169	$14	66%	0.1	$244
8519814050	SOUND RECORD APP MGNT/OPTCL/SEMICNDCTR MEDIA NESOI	$5	0.3	$15,563	0.1	$72	217	$2	39%	0.0	$284
8471900000	MACHINES AND UNITS THEREOF FOR PROCESS DATA, NESOI	$56	2.6	$21,745	0.1	$958	23	$20	36%	0.1	$252
8510100000	ELECTRIC SHAVERS	$3	0.1	$27,009	0.1	$29	945	$0	0%	0.0	$698
9025198080	THERMOMETERS, NT COMBINED WITH OTH INST, NESOI	$26	1.9	$14,262	2.3	$11	1,254	$5	18%	0.0	$390
9031499000	OTHER OPTICAL INSTRUMENTS AND APPLIANCES,NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
8510209000	HAIR CLIPPERS, ELECTRIC, NESOI	$0	-	$0	-	N/A	-	$0	0%	-	$0
9030310000	MULTIMETERS WITHOUT A RECORDING DEVICE	$6	0.4	$13,745	0.1	$57	241	$2	39%	0.0	$177
8510300000	HAIR-REMOVING APPLIANCES WITH ELECTRIC MOTOR	$0	0.0	$8,814	0.0	$16	535	$0	12%	0.0	$25
		$234	13.7	$17,108	3.0	$78	218	$92	39%	0.4	$250
All Electronic Commodities		$872	42.1	$20,724	7.2	$122	170	$373	43%	1.3	$298

U.S. FOREIGN TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

		Trade via All Modes						Trade via Air			
		Value (Million $)	Shipments (000)	Value per shipment	Units (millions) 1/	Value per unit 1/	Units per Shipment 1/	Value (Million $) 2/	% of Total 2/	Weight (000 MT) 2/	Value per kilogram
B-1 IMPORTS FROM OVERSEAS (BATTERIES)											
Post-July 2009 Classification (JUL-DEC)											
8507808010	LITHIUM-ION STORAGE BATTERIES	$388	13.5	$28,670	37.4	$10	2,760	$294	76%	6.1	$48
8507808020	NICKEL-METAL HYDRIDE STORAGE BATTERIES	$114	3.4	$33,298	40.6	$3	11,918	$27	24%	0.6	$43
8507808050	ELECTRIC STORAGE BATTERIES, NESOI	$84	3.5	$23,760	18.7	$5	5,279	$45	53%	1.0	$45
		$586	20.5	$28,592	96.7	$6	4,718	$365	62%	7.7	$47
	Lithium-Ion Share of JUL-DEC Trade	66%	66%		39%			80%		79%	
Pre-July 2009 Classification (JAN-JUN)											
8507808000	ELECTRIC STORAGE BATTERIES, NESOI	$472	16.8	$28,140	76.2	$6	4,546	$265	56%	4.3	$62
	CY 2009 Total	$1,058	37.9	$27,911	173.3	$6	4,570	$631	60%	12.8	$49
	LITHIUM-ION STORAGE BATTERIES - CY Estimate 3/	$702	25.1	$27,987	67.5	$10	2,694	$507	72%	10.1	$50

1/ Aggregate values are estimated for commodity groups with missing quantity data based on the weighted average value for commodities with known quantity.
2/ Air value is adjusted for overseas trade to account for trade that is transshipped via Canada or Mexico.
3/ Calendar year trade volumes estimated assuming the same share of value, shipments, units and weight as for July-December.

Source: U.S. Bureau of the Census, Foreign Trade Statistics

U.S. PATTERNS FOR INBOUND AND OUTBOUND AIR TRADE OF LITHIUM ION BATTERIES AND RELATED PRODUCTS (2009)

	Trade Value (million $)			Air Value (million $)			Air Weight (000 MT)			High Air Share Trade - Air Trade Patterns			
	Total	High Air Share	% of Total	Total	High Air Share	% of Total	Total	High Air Share	% of Total	Units (millions)	Shipments (000)	Units per Shipment	Kilos per Unit 1/
1. U.S. IMPORTS													
Cellphones & Related Products	$48,704	$32,253	66%	$34,636	$32,163	93%	108.8	95.4	88%	175.4	279.4	628	0.55
Notebook and Handheld Computers	$26,915	$19,525	73%	$23,105	$19,370	84%	144.8	117.9	81%	31.0	208.8	148	3.84
Audio & Video Equipment	$16,236	$7,270	45%	$8,908	$7,211	81%	52.3	37.5	72%	70.9	84.2	842	0.53
Hand Power Tools	$1,753	$37	2%	$52	$37	70%	1.3	0.8	59%	0.4	2.4	166	1.90
Other Electronic Products	$5,791	$2,003	35%	$2,566	$1,986	77%	18.9	12.5	66%	20.1	68.5	294	0.63
Combined Total	$99,399	$61,087	61%	$69,266	$60,767	88%	326.0	264.0	81%	297.9	643.3	463	0.89
Lithium Ion Batteries	$390	$240	61%	$274	$236	86%	5.7	5.2	92%	24.5	9.6	2,567	0.22
2. U.S. EXPORTS AND RE-EXPORTS													
Cellphones & Related Products	$12,180	$8,692	71%	$9,199	$8,642	94%	27.3	25.1	92%	18.1	226.2	80	1.40
Notebook and Handheld Computers	$4,110	$2,242	55%	$2,742	$2,220	81%	15.9	12.5	79%	3.4	68.8	50	3.68
Audio & Video Equipment	$1,678	$1,023	61%	$1,146	$1,013	88%	5.2	4.3	84%	6.4	31.3	205	0.68
Hand Power Tools	$104	$10	10%	$11	$10	92%	0.5	0.5	95%	0.1	1.0	93	5.23
Other Electronic Products	$3,090	$1,710	55%	$1,983	$1,696	86%	12.2	9.7	80%	4.2	68.6	61	2.34
Combined Total	$21,163	$13,678	65%	$15,082	$13,581	90%	61.1	52.2	85%	32.2	396.0	81	1.63

1/ Estimated based on average value per unit for all modes and average air value per kilogram.

"High Air Share Trade" includes all commodity and country-specific flows for which air value accounted for 90% or more of total value via all modes.

Source: U.S. Bureau of the Census, Foreign Trade Statistics

DOMESTIC SHIPMENTS OF ELECTRRONICS BY AIR OR MAIL/COURIER AND INDUSTRY TYPE (2007)

	Computer and electronic product manufacturing	Electrical and electronic goods merchant wholesalers	Electronic shopping and mail-order houses	Non-Manufacturing Subtotal	Ratio of Wholesalers to Manufacturing
NAIC Code:	334	4236	4541		
Domestic Shipment via All Modes					
Value (Milllion $)	$268,393	$276,410	$35,102	$311,512	1.03
Weight (000 MT)	2,562	15,181	628	15,809	5.93
Average Value per Kilogram	$105	$18	$56	$20	
Domestic Shipment via Air					
Value (Milllion $)	$38,111	$23,816	$1,626	$25,442	0.62
Share of Value by All Modes	14%	9%	5%	8%	
Weight (000 MT)	128	70	8	78	0.55
Share of Weight by All Modes	5%	0%	1%	0%	
Average Value per Kilogram	$298	$341	$199	$326	
Domestic Shipment via Mail and Courier					
Value (Milllion $)	$102,269	$90,512	$25,458	$115,970	0.89
Share of Value by All Modes	38%	33%	73%	37%	
Weight (000 MT)	384	1,209	432	1,641	3.15
Share of Weight by All Modes	15%	8%	69%	10%	
Average Value per Kilogram	$267	$75	$59	$71	
Domestic Shipment via Air, Mail and Courier					
Value (Milllion $)	$140,380	$114,328	$27,084	$141,412	0.81
Share of Value by All Modes	52%	41%	77%	45%	
Weight (000 MT)	512	1,279	440	1,719	2.50
Share of Weight by All Modes	20%	8%	70%	11%	
Average Value per Kilogram	$274	$89	$62	$82	

Source: U.S. Bureau of the Census, Commodity Flow Survey (2007)

SHIPMENT SIZE CHARACTERISTICS FOR U.S. DOMESTIC SHIPMENTS OF ELECTRONICS BY AIR OR MAIL/COURIER (2007)

	Shipment Value		Shipment Weight		Average	Average Shipment Size 1/		Estimated Number of Shipment	
Shipment Size Category	(Million $)	% of Total	(000 MT)	% of Total	Value per Kilogram	Pounds	Kilograms	(000)	% of Total
Less than 50 lbs	$275,330	58%	1,750	42%	$157	25	11	154,320	82%
50 - 99 lbs	$62,968	13%	717	17%	$88	75	34	21,067	11%
100 - 499 lbs	$101,396	21%	1,223	29%	$83	250	113	10,784	6%
500 - 749 lbs	$13,842	3%	212	5%	$65	625	283	749	0%
750 - 999 lbs	$6,199	1%	52	1%	$120	875	397	130	0%
1,000 - 9,999 lbs	$12,318	3%	164	4%	$75	5,500	2,495	66	0%
10,000 - 49,999 lbs	$185	0%	54	1%	$3	30,000	13,608	4	0%
50,000 - 99,999 lbs 2/	$5	0%	37	1%	$0	75,000	34,020	1	0%
Total	$472,243	100%	4,209	100%	$112	50	22	187,121	100%
Under 500 Pounds	$439,694	93%	3,690	88%	$119	70	32	186,171	99%
Over 50 Pounds	$196,913	42%	2,459	58%	$80	75	34	32,801	18%

1/ Average shipment size based on mid-point for range with overall average based on distribution for estimated shipments.
2/ Estimated as difference between total and shipment categories for which data were not suppressed.

Note: Commodity group = "35 Electronic & other electrical equip & components & office equip"
Modes = "Air (incl truck and air)" and "Parcel, U.S.P.S. or courier"

Source: U.S. Bureau of the Census, Commodity Flow Survey (2007)

ASIAN AIR EXPORTS FOR SELECTED COMMODITY GROUPS (CY 2008)

Commodity Group/Service Type	North America # of Shipments	North America % of Total	Rest of World # of Shipments	Rest of World % of Total	World Total # of Shipments	World Total % of Total	Ratio of Rest of World to North America
Radio & Mobile Telecommunications							
Express	718,359	90%	2,231,280	86%	2,949,640	87%	3.11
Standard	82,105	10%	365,068	14%	447,173	13%	4.45
	800,464	100%	2,596,348	100%	3,396,813	100%	**3.24**
PC's and Laptops							
Express	1,735,906	91%	2,025,274	91%	3,761,181	91%	1.17
Standard	168,645	9%	194,075	9%	362,721	9%	1.15
	1,904,551	100%	2,219,350	100%	4,123,901	100%	**1.17**
Home Entertainment Equipment							
Express	284,672	79%	484,335	79%	769,007	79%	1.70
Standard	74,651	21%	132,205	21%	206,857	21%	1.77
	359,323	100%	616,540	100%	975,863	100%	**1.72**
Tools, Tooling & Machine Tool Parts							
Express	66,762	73%	184,273	75%	251,035	75%	2.76
Standard	24,104	27%	60,965	25%	85,069	25%	2.53
	90,866	100%	245,238	100%	336,104	100%	**2.70**
Total - Primary Affected Commodity Groups							
Express	2,805,700	89%	4,925,162	87%	7,730,862	88%	1.76
Standard	349,505	11%	752,314	13%	1,101,819	12%	2.15
	3,155,205	100%	5,677,476	100%	8,832,681	100%	1.80
Share of All Commodities							
Express	16.7%		12.0%		13.4%		
Standard	13.6%		9.8%		10.7%		
	16.3%		11.6%		13.0%		

ASIAN AIR EXPORTS FOR SELECTED COMMODITY GROUPS (CY 2008)

Commodity Group/Service Type	North America # of Shipments	North America % of Total	Rest of World # of Shipments	Rest of World % of Total	World Total # of Shipments	World Total % of Total	Ratio of Rest of World to North America
Dangerous Goods							
Express	220	29%	614	76%	834	53%	2.80
Standard	526	71%	199	24%	725	47%	0.38
	746	100%	813	100%	1,559	100%	1.09
Other Special Handling							
Express	1,430	55%	1,095	57%	2,525	55%	0.77
Standard	1,190	45%	835	43%	2,025	45%	0.70
	2,619	100%	1,930	100%	4,549	100%	0.74
Total - Special Handling							
Express	1,649	49%	1,709	62%	3,359	55%	1.04
Standard	1,716	51%	1,034	38%	2,750	45%	0.60
	3,365	100%	2,743	100%	6,108	100%	0.82
Share of All Commodities							
Express	0.0%		0.0%		0.0%		
Standard	0.1%		0.0%		0.0%		
	0.0%		0.0%		0.0%		
All Other Commodities							
Express	13,978,382	86%	36,119,804	84%	50,098,185	85%	2.58
Standard	2,223,589	14%	6,947,893	16%	9,171,482	15%	3.12
	16,201,971	100%	43,067,696	100%	59,269,667	100%	2.66
Total - All Commodities							
Express	16,785,731	87%	41,046,675	84%	57,832,406	85%	2.45
Standard	2,574,810	13%	7,701,240	16%	10,276,050	15%	2.99
	19,360,542	100%	48,747,915	100%	68,108,457	100%	2.52

Note: Exporting countries include China, Hong Kong, Indonesia, Japan, South Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand.

Source: Seabury Air Trade Data

U.S. BUSINESS LOGISTICS COSTS BY COST CATEGORY (2008)

	Billions of US $	% of Total	% of Transport Costs
Transportation Carrier Costs			
Air	$41	2.9%	
Water	$38	2.7%	
Truck	$671	48.1%	
Rail	$58	4.2%	
Pipeline	$10	0.7%	
	$818	58.7%	
Other Transportation Provider Costs			
Freight Forwarder	$30	2.2%	**3.7%**
Warehousing	$111	8.0%	**13.6%**
Logistics Administration	$54	3.9%	**6.6%**
	$195	14.0%	**23.8%**
Shipper Costs	$8	0.6%	**1.0%**
Carrying Costs			
Interest	$102	7.3%	**12.5%**
Taxes, Obsolescence, Depreciation, Insurange	$271	19.4%	**33.1%**
	$373	26.8%	**45.6%**
	$1,394	100.0%	
U.S. GDP	$14,441		
Logistics System Share of GDP	10%		

Source: "20th Annual State of Logistics Report", Council of Supply Chain Management Professionals

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
1. Cellphones & Related Products								
Number of Units (millions)	218.6	8.4	11.2	238.1		43.7	43.7	229.7
Share of Imports						20%		
Number of Shipments (000)	348.0	105.2	139.9	593.1		348.0	348.0	941.2
Value (million $)	$37,542	$3,732	$5,482			$7,508		$43,024
Value per Unit	$172	$444	$491			$172		$172
Weight (000 MT)	119.2	11.7	15.6	146.6		23.8	23.8	134.8
Average Shipment Weight (kilograms)	342.5	111.6	111.6			68.5		
Percent Affected by Rule	50%	50%	50%			60%		
Number of Affected Units (millions)	109.3	4.2	5.6	119.1		26.2	26.2	114.9
Number of Affected Shipments (000)	174.0	52.6	69.9	296.6		208.8	208.8	505.4
Packaging Impact								
Unit Cost	$1.25	$0.00	$1.25			$0.00		
Units per Package	2.05	1.00	2.05			1.00		
Total Cost Impact (million $)	$67	$0	$3	$70		$0	$0	$70
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$420	$161	$161			$45		
Total Cost Impact (million $)	$73	$8	$11	$93		$9	$9	$102
Ratio of Other Services								24%
								$127
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.9%	0.9%	0.9%			0.9%		
Total Cost Impact (million $)	$169	$17	$25	$210		$20	$20	$231
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								5,054
Cost per Employee								$400
Total Cost Impact (million $)								$2.0
Combined Cost Impacts								
Total Cost Impact (million $)	$309	$25	$39	$373		$30	$30	$429
per Unit *	$1.41	$4.42	$7.93			$2.09		$1.87
% of Unit Value	0.8%	1.0%	1.6%			1.2%		1.0%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	1.4	0.1	0.2	1.6		0.5	0.5	2.2
Sales (million $)	$216	$37	$89	$342		$91	$91	$434

* Adjusted for imports that are transshipped to domestic or foreign markets.

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
2. Notebook and Handheld Computers								
Number of Units (millions)	38.1	2.1	2.2	42.4		7.6	7.6	40.3
Share of Imports						20%		
Number of Shipments (000)	256.7	42.3	44.6	343.6		256.7	256.7	600.3
Value (million $)	$23,321	$1,584	$1,166			$4,664		$24,487
Value per Unit	$613	$750	$523			$613		$613
Weight (000 MT)	146.1	7.8	8.2	162.1		29.2	29.2	154.3
Average Shipment Weight (kilograms)	569.2	183.7	183.7			113.8		
Percent Affected by Rule	50%	50%	50%			75%		
Number of Affected Units (millions)	19.0	1.1	1.1	21.2		5.7	5.7	20.1
Number of Affected Shipments (000)	128.4	21.1	22.3	171.8		192.5	192.5	364.4
Packaging Impact								
Unit Cost	$1.25	$0.00	$1.25			$0.00		
Units per Package	1.00	1.00	1.00			1.00		
Total Cost Impact (million $)	$24	$0	$1	$25		$0	$0	$25
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$675	$242	$242			$52		
Total Cost Impact (million $)	$87	$5	$5	$97		$10	$10	$107
Ratio of Other Services								24%
								$133
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.5%	0.5%	0.5%			0.5%		
Total Cost Impact (million $)	$58	$4	$3	$65		$9	$9	$74
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								3,644
Cost per Employee								$400
Total Cost Impact (million $)								$1.5
Combined Cost Impacts								
Total Cost Impact (million $)	$169	$9	$10	$188		$19	$19	$233
per Unit *	$4.43	$8.73	$13.08			$6.90		$5.79
% of Unit Value	0.7%	1.2%	2.5%			1.1%		1.0%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	0.2	0.0	0.1	0.3		0.1	0.1	0.4
Sales (million $)	$124	$18	$29	$171		$53	$53	$224

* Adjusted for imports that are transshipped to domestic or foreign markets.

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
3. Audio & Video Equipment								
Number of Units (millions)	99.6	3.8	3.9	107.2		19.9	19.9	103.5
Share of Imports						20%		
Number of Shipments (000)	118.3	18.3	18.8	155.4		118.3	118.3	273.7
Value (million $)	$9,041	$590	$564			$1,808		$9,605
Value per Unit	$91	$157	$146			$91		$91
Weight (000 MT)	53.0	2.6	2.6	58.2		10.6	10.6	55.7
Average Shipment Weight (kilograms)	448.2	139.8	139.8			89.6		
Percent Affected by Rule	50%	50%	50%			60%		
Number of Affected Units (millions)	49.8	1.9	1.9	53.6		12.0	12.0	51.7
Number of Affected Shipments (000)	59.2	9.1	9.4	77.7		71.0	71.0	148.7
Packaging Impact								
Unit Cost	$1.25	$0.00	$1.25			$0.00		
Units per Package	1.00	1.00	1.00			1.00		
Total Cost Impact (million $)	$62	$0	$2	$65		$0	$0	$65
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$539	$192	$192			$48		
Total Cost Impact (million $)	$32	$2	$2	$35		$3	$3	$39
Ratio of Other Services								24%
								$48
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.9%	0.9%	0.9%			0.9%		
Total Cost Impact (million $)	$41	$3	$3	$46		$5	$5	$51
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								1,487
Cost per Employee								$400
Total Cost Impact (million $)								$0.6
Combined Cost Impacts								
Total Cost Impact (million $)	$135	$4	$7	$146		$8	$8	$164
per Unit *	$1.35	$2.53	$4.28			$1.77		$1.59
% of Unit Value	1.5%	1.6%	2.9%			2.0%		1.7%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	1.1	0.1	0.1	1.3		0.4	0.4	1.7
Sales (million $)	$99	$9	$17	$125		$35	$35	$160

* Adjusted for imports that are transshipped to domestic or foreign markets.

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
4. Hand Power Tools								
Number of Units (millions)	0.7	0.1	0.1	0.8		0.3	0.3	0.7
Share of Imports						50%		
Number of Shipments (000)	4.1	0.5	0.6	5.2		10.2	10.2	15.4
Value (million $)	$53	$3	$10			$27		$63
Value per Unit	$78	$51	$182			$78		$78
Weight (000 MT)	1.3	0.3	0.3	1.8		0.6	0.6	1.6
Average Shipment Weight (kilograms)	316.6	489.3	489.3			63.3		
Percent Affected by Rule	50%	50%	50%			60%		
Number of Affected Units (millions)	0.3	0.0	0.0	0.4		0.2	0.2	0.4
Number of Affected Shipments (000)	2.0	0.3	0.3	2.6		6.1	6.1	8.7
Packaging Impact								
Unit Cost	$1.75	$1.75	$1.75			$1.75		
Units per Package	1.00	1.00	1.00			1.00		
Total Cost Impact (million $)	$1	$0	$0	$1		$0	$0	$1
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$391	$585	$585			$44		
Total Cost Impact (million $)	$0.8	$0.2	$0.2	$1.1		$0.3	$0.3	$1.4
Ratio of Other Services								24%
								$2
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.5%	0.5%	0.5%			0.5%		
Total Cost Impact (million $)	$0	$0	$0	$0		$0	$0	$0
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								87
Cost per Employee								$400
Total Cost Impact (million $)								$0.0
Combined Cost Impacts								
Total Cost Impact (million $)	$2	$0	$0	$2		$1	$1	$3
per Unit *	$2.25	$6.38	$10.84			$4.22		$4.11
% of Unit Value	2.9%	12.6%	6.0%			5.4%		4.8%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Sales (million $)	$1	$0	$1	$2		$1	$1	$3

* Adjusted for imports that are transshipped to domestic or foreign markets.

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
5. Other Electronic Goods								
Number of Units (millions)	30.8	1.7	3.6	36.0		6.2	6.2	34.4
Share of Imports						20%		
Number of Shipments (000)	104.9	27.1	58.4	190.4		104.9	104.9	295.2
Value (million $)	$2,633	$620	$1,373			$527		$4,007
Value per Unit	$85	$375	$386			$85		$85
Weight (000 MT)	19.3	3.9	8.3	31.5		3.9	3.9	27.7
Average Shipment Weight (kilograms)	184.3	142.9	142.9			36.9		
Percent Affected by Rule	50%	50%	50%			60%		
Number of Affected Units (millions)	15.4	0.8	1.8	18.0		3.7	3.7	17.2
Number of Affected Shipments (000)	52.4	13.5	29.2	95.2		62.9	62.9	158.1
Packaging Impact								
Unit Cost	$1.25	$0.00	$1.25			$0.00		
Units per Package	1.00	1.00	1.00			1.00		
Total Cost Impact (million $)	$19	$0	$2	$21		$0	$0	$21
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$242	$196	$196			$41		
Total Cost Impact (million $)	$13	$3	$6	$21		$3	$3	$24
Ratio of Other Services								24%
								$29
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.9%	0.9%	0.9%			0.9%		
Total Cost Impact (million $)	$12	$3	$6	$21		$1	$1	$22
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								1,581
Cost per Employee								$400
Total Cost Impact (million $)								$0.6
Combined Cost Impacts								
Total Cost Impact (million $)	$44	$5	$14	$63		$4	$4	$74
per Unit *	$1.42	$4.72	$8.68			$2.07		$2.14
% of Unit Value	1.7%	1.3%	2.3%			2.4%		1.8%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	0.4	0.0	0.1	0.5		0.1	0.1	0.6
Sales (million $)	$25	$8	$31	$63		$13	$13	$76

* Adjusted for imports that are transshipped to domestic or foreign markets.

ESTIMATED COST IMPACTS

	International				Domestic			Combined
	Imports	Re-Exports	Exports	Total	U.S. Origin	Transfer	Total	Total*
6. Lithium Ion Batteries								
Number of Units (millions)	46.8	-	-	46.8		23.4	23.4	46.8
Share of Imports						50%		
Number of Shipments (000)	18.2	-	-	18.2		45.6	45.6	63.8
Value (million $)	$507	$0	$0			$254		$507
Value per Unit	$11	$0	$0			$11		$11
Weight (000 MT)	10.1	-	-	10.1		5.0	5.0	10.1
Average Shipment Weight (kilograms)	553.4	-	-			110.7		
Percent Affected by Rule	75%	75%	75%			90%		
Number of Affected Units (millions)	35.1	-	-	35.1		21.1	21.1	35.1
Number of Affected Shipments (000)	13.7	-	-	13.7		41.0	41.0	54.7
Packaging Impact								
Unit Cost	$1.25	$0.00	$1.25			$0.00		
Units per Package	25.00	25.00	25.00			25.00		
Total Cost Impact (million $)	$2	$0	$0	$2		$0	$0	$2
Transport and Related Services Impacts								
Per Shipment Fee	$35	$35	$35			$35		
Per Kilogram Surcharge	$1.50	$1.50	$1.50			$1.50		
Share with Kilogram Surcharge	75%	75%	75%			10%		
Weighted Cost Impact Per Shipment	$658	$35	$35			$52		
Total Cost Impact (million $)	$9	$0	$0	$9		$2	$2	$11
Ratio of Other Services								24%
								$14
Inventory Cost Impacts								
Average Delay per Shipment (days)	1.00	1.00	1.00			0.50		
Value of Time Saving per Day	0.9%	0.9%	0.9%			0.9%		
Total Cost Impact (million $)	$3	$0	$0	$3		$1	$1	$4
Training Impacts								
Ratio of Employees per 1,000 Shipments								10.0
Total Employees								547
Cost per Employee								$400
Total Cost Impact (million $)								$0.2
Combined Cost Impacts								
Total Cost Impact (million $)	$14	$0	$0	$14		$3	$3	$20
per Unit *	$0.30	$0.00	$0.00			$0.44		$0.43
% of Unit Value	2.8%	0.0%	0.0%			4.0%		4.0%
Lost Sales Impacts (at 1.0 elasticity)*								
Number of Units (millions)	0.7	-	-	0.7		0.9	0.9	1.6
Sales (million $)	$7	$0	$0	$7		$10	$10	$17

* Adjusted for imports that are transshipped to domestic or foreign markets.

SUMMARY OF INDUSTRY-BASED COST IMPACTS

	Cellphones & Related Products	Notebook and Handheld Computers	Audio & Video Equipment	Hand Power Tools	Other Electronic Goods	Lithium Ion Batteries	Total
Summary Direct Cost Impacts (million $)							
Packaging	$70.0	$25.2	$64.7	$1.0	$21.5	$1.8	$182.4
Air Transport and Other Services	$126.6	$132.8	$48.2	$1.7	$29.3	$13.8	$338.6
Inventory	$230.7	$73.9	$50.8	$0.2	$22.2	$4.5	$377.8
Training	$2.0	$1.5	$0.6	$0.0	$0.6	$0.2	$4.7
	$429.4	$233.3	$164.2	$3.0	$73.6	$20.2	$903.5
Foreign-to-Foreign Impacts							
Ratio of Foreign-to-Foreign to U.S. Trade	3.24	1.17	1.72	2.70	1.72	1.00	
U.S. Company Share of Total Trade	50%	50%	50%	50%	50%	50%	
Express Share of Air Shipments	86%	91%	79%	75%	79%	82%	
U.S. Airline Share of Trade	25%	25%	25%	25%	25%	25%	
Foreign-to-Foreign Cost Impacts (million $)	$149.6	$31.0	$27.7	$0.8	$12.4	$2.1	$223.5
							$1,127.1
U.S.-Based Trade Impacts							
Total Product Value (million $)	$43,024	$24,487	$9,605	$63	$4,007	$507	$81,185
Number of Units (million)	229.7	40.3	103.5	0.7	34.4	46.8	408.6
Affected by Rule	114.9	20.1	51.7	0.4	17.2	35.1	204.3
Share Affected	50%	50%	50%	50%	50%	75%	50%
Average Unit Value	$187	$608	$93	$86	$116	$11	$199
Average Cost Impact per Unit	$1.87	$5.79	$1.59	$4.11	$2.14	$0.43	$2.21
% of Unit Value	1.0%	1.0%	1.7%	4.8%	1.8%	4.0%	1.1%
Number of Shipments (000)	941.2	600.3	273.7	15.4	295.2	63.8	2,125.8
Affected by Rule	505.4	364.4	148.7	8.7	158.1	54.7	1,185.2
Share Affected	54%	61%	54%	57%	54%	86%	56%
Average Cost Impact per Shipment	$456	$389	$600	$195	$249	$316	$425
Lost Sales Impacts							
Number of Units (million)	2.2	0.4	1.7	0.0	0.6	1.6	4.9
Sales (million $)	$434	$224	$160	$3	$76	$17	$897

Summary Description of 17 Lithium Ion Battery Incidents between 1998 and 2009

Date	Description	Aircraft Type	Airline
8/25/09	Burning and smoking package found at Medford, MA cargo facility	Cargo	FedEx
6/18/09	Smoldering package at Taipei cargo hub	Cargo	UPS
7/15/09	Package discovered emitting smoke and smoldering in Dominion Republic	Cargo	UPS
6/18/09	Burned package discovered in ULD while unloading in Honolulu	Cargo	UPS
8/06/08	Package found smoking in Copenhagen ground sort facility	Cargo	UPS
12/15/07	Package discovered emitting smoke at sort center in Frankfurt	Cargo	FedEx
12/11/07	Box cut into and started a fire during inspection in customs office	Cargo	UPS
9/30/07	Box emitted smoke when offload at Subic Bay sort center	Cargo	FedEx
8/08/07	One battery in a package started to burn during custom inspection at Frankfurt	Cargo	FedEx
11/11/06	Battery started emitting sparking flames, and smoke during cargo inspection	Cargo	?
7/17/06	Package caught fire while held in bond for customs in Korea	Cargo	FedEx
6/02/06	Fire in the cargo hold; flight diverted	Passenger	Air China
3/03/06	Package smoking at FedEx station at Shenzen	Cargo	FedEx

Date	Description	Aircraft Type	Airline
6/29/05	While unloading cargo from a ULD it was discovered that a fire had taken place (burnt package)	Cargo	UPA
8/07/04	Fire started during ULD loading process at Memphis hub	Cargo	FedEx
8/12/04	Burning odor at FedEx sort center at Los Angeles	Cargo	FedEx
10/10/98	Fire warning diverted flight. After landing, discovered heat rising between pallets on jet flat and strange odor	Cargo	?

Source: FAA, Batteries & Battery-Powered Devices, Aviation Incidents Involving Smoke, Fire, Extreme Heat or Explosion, as of September 24, 2009. See also, http://www.faa.gov/about/office_org/headquarters_/offices/ash/ash_programs/hazmat/aircarrier_info/.

The Estimated Savings Due To Aircraft Fires Avoided Involving Lithium Ion Batteries Is $1,000

Line	Item		Comment
1.	No. of lithium fires on aircraft during the ten years 1995 – 2004	= 4	PHMSA Report, Page 18.
2.	No. of relevant lithium ion fires	= 1.54	Line 1 x 38.6%
3.	Cost per aircraft fire where lithium was involved (1998 – 2009)	= $6,200	HMIS data (Exhibit 4-6)
4.	Future growth in fires per year	= 0.0%	No growth in HMIS data
5.	Cost of relevant lithium ion battery Related aircraft fires over the next 10 years	= $10,000	Lines 2 x 3 (rounded)
6	Cost per year of relevant lithium ion battery related aircraft fires	= $1,000	Line 5 ÷ 10
7.	Cost per year of relevant lithium battery related aircraft fires	= $1,600	Line 6 x $\frac{27^{1}}{17}$

[1] PHMSA's source data (See PHMSA Report, page 15) shows 27 total lithium battery related incidents, of which 17 are lithium ion and 10 are lithium primary.

PHMSA's Estimate of Potential Cost Savings (Benefit) Achieved Is Illogical and Unsupported By the Data

Line	Item	Comment
	From HMIS Records – According to PHMSA From 1995-2004 (Ten Years):	
1.	– 45 Hazmat fires on all aircraft types	No mention if all U.S. Part 121 operations.
2.	– 4 of these (9%) involved shipments of lithium ion batteries	No mention if batteries caused fires.
3.	– 15 of the 45 were fires on passenger aircraft at a total cost of \$487.7 million. The ValuJet crash accounted for \$336.0 million.	ValuJet fire is irrelevant to this rulemaking. Others may also be irrelevant.
4.	– No. of passenger aircraft fires per year = 1.5	Line 3 ÷ 10 = 1.5
5.	– Cost of fires on 4 flights with lithium batteries = \$487.7 million x 9% = \$43.9 million = \$4.4 million per year in 2005 dollars and assumed to be \$5.0 million in 2009 dollars	There is no association between the 4 fires with lithium batteries and the cost of fires on passenger planes
6.	– Cost per year per passenger aircraft fire – = \$5.0 million 1.5 per year = \$3.33 million per year	Line 5 ÷ Line 4
	From Lithium Battery Incident Data	
7.	– No. of incidents per year for the period 1998 through 2009 = 2.1 per year	From p.15-16 of PHMSA Cost-Benefit Analysis
8.	– Assumed increased number of incidents per year for the next 10 years = 3.0 incidents per year	Assumption by PHMSA
9.	Estimated cost savings per year due to PHMSA rulemaking proposal = \$3.33 Million x 3.0 = \$10.0 Million per year	Line 6 x Line 7

There is no empirical connection between the two databases used by PHMSA. The analysis is illogical, unsupportable and inadequately researched. The ultimate conclusion made by PHMSA is erroneous.

List of FAA Air Carrier Accident Findings: 1985 - 2004

Table G.1A Accident History

DATE	COUNT	LOCATION	AIRCRAFT MODEL	FATALITIES	FATAL/ NONFATAL	SERIOUS INJURIES	DAMAGE	AIRCRAFT DAMAGE COST	TOTAL COST OF ACCIDENTS
01/09/1985	1	Kansas City, KS	L188	3	FATAL	0	DESTROYED	$813,721	$9,813,721
02/04/1985	2	Soldotna, AK	BCH65	9	FATAL	0	DESTROYED	$476,608	$27,476,608
02/05/1985	3	Charlotte, NC	DC3	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
02/05/1985	4	Philadelphia, PA	DC9	0	NONFATAL	2	SUBSTANTIAL	$174,369	$1,335,769
03/08/1985	5	Hailey, ID	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
03/12/1985	6	Barter Island, AK	DHC6-200	0	NONFATAL	2	DHC6-200	$69,747	$1,231,147
03/23/1985	7	Hot Springs, AR	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
04/23/1985	8	Little Rock, AR	B727	0	NONFATAL	1	NONE	$0	$580,700
04/28/1985	9	Amarillo, TX	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
05/28/1985	10	San Juan, PR	A-300	0	NONFATAL	2	NONE	$0	$1,161,400
05/31/1985	11	Nashville, TN	GA159	2	FATAL	0	DESTROYED	$360,362	$6,360,362
06/23/1985	12	South Haven, MI	B727	0	NONFATAL	2	NONE	$0	$1,161,400
06/23/1985	12		CE-421		NONFATAL		SUBSTANTIAL	$0	$0
08/02/1985	13	Dallas, TX	L1011	135	FATAL	15	DESTROYED	$5,591,423	$419,301,923
08/07/1985	14	Dallas, TX	Fairchild	0	NONFATAL	0	SUBSTANTIAL	$604,478	$604,478
09/23/1985	15	Grottoes Grove, VA	BCH99	14	FATAL	0	DESTROYED	$2,034,301	$44,034,301
09/25/1985	16	Unalaska, AK	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
10/18/1985	17	Fort Lauderdale, FL	CE421	0	NONFATAL	0	SUBSTANTIAL	$92,997	$92,997
02/07/1986	18	Mekoryuk, AK	DHC6-100	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
02/20/1986	19	Denver, CO	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
02/21/1986	20	Erie, PA	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
03/13/1986	21	Alpena, MI	EMB EMB-110	3	FATAL	5	DESTROYED	$2,034,301	$13,937,801
05/04/1986	22	Alamosa, CO	B737	0	NONFATAL	2	NONE	$0	$1,161,400
05/20/1986	23	Hutchinson, KS	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
09/24/1986	24	Galesburg, IL	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
10/04/1986	25	San Antonio, TX	L382	3	FATAL	0	DESTROYED	$406,860	$9,406,860
10/25/1986	26	Charlotte, NC	B737	0	NONFATAL	3	DESTROYED	$9,346,162	$11,088,262
10/30/1986	27	Santa Barbara, CA	SA227	0	NONFATAL	1	SUBSTANTIAL	$162,744	$743,444
12/15/1986	28	Salt Lake City, UT	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
02/11/1987	29	Detroit, MI	B747	0	NONFATAL	3	NONE	$0	$1,742,100
03/04/1987	30	Romulus, MI	CASA212	9	FATAL	7	DESTROYED	$662,601	$31,727,501
04/13/1987	31	Kansas City, MO	B707	4	FATAL	0	DESTROYED	$685,850	$12,685,850
08/04/1987	32	Palmdale, CA	DHC6-300	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
08/04/1987	32		CE172		NONFATAL		SUBSTANTIAL	$12,787	$12,787
08/20/1987	33	Newburgh, NY	DC8	0	NONFATAL	0	SUBSTANTIAL	$1,964,554	$1,964,554
08/20/1987	33		DC9		NONFATAL		SUBSTANTIAL	$174,369	$174,369
08/25/1987	34	Atlanta, GA	L1011	0	NONFATAL	0	SUBSTANTIAL	$755,598	$755,598
09/15/1987	35	Tulsa, OK	B727	0	NONFATAL	0	SUBSTANTIAL	$453,359	$453,359
10/23/1987	36	Fairfield, CA	CE-208	1	FATAL	0	DESTROYED	$1,052,024	$4,052,024
10/28/1987	37	Bartlesville, OK	CVAC	0	NONFATAL	0	DESTROYED	$488,232	$488,232
11/15/1987	38	Denver, CO	DC9	28	FATAL	28	DESTROYED	$1,278,704	$101,538,304
11/23/1987	39	Homer, AK	1900C	18	FATAL	3	DESTROYED	$2,255,168	$57,997,268
12/14/1987	40	Joplin, MO	JETSTM3101	0	NONFATAL	2	DESTROYED	$1,453,072	$2,614,472
12/17/1987	41	Chantilly, VA	SA227	0	NONFATAL	1	SUBSTANTIAL	$162,744	$743,444
12/19/1987	42	Bethel, AK	CE208	0	NONFATAL	0	SUBSTANTIAL	$173,206	$173,206
12/23/1987	43	Maukaloa, HI	PIPER PA-31	8	FATAL	0	DESTROYED	$650,976	$24,650,976
12/27/1987	44	Pensacola, FL	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369

List of FAA Air Carrier Accident Findings: 1985 - 2004

Table G.1B Accident History									
DATE	COUNT	LOCATION	AIRCRAFT MODEL	FATALITIES	FTL/NONFTL	SERIOUS INJURIES	DAMAGE	AIRCRAFT DAMAGE COST	TOTAL COST OF ACCIDENTS
01/19/1988	45	Bayfield, CO	SA227	9	FATAL	1	DESTROYED	$1,197,332	$28,778,032
02/19/1988	46	Cary, NC	SA227	12	FATAL	0	DESTROYED	$1,197,332	$37,197,332
06/05/1988	47	Chicago, IL	DO228-201	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
06/17/1988	48	Tau, AS	DHC6	0	NONFATAL	1	DESTROYED	$546,355	$1,127,055
07/27/1988	49	Anchorage, AK	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
08/16/1988	50	Cleveland, OH	SA227	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
08/31/1988	51	Dallas,TX	B727	14	FATAL	26	DESTROYED	$3,382,753	$60,480,953
09/09/1988	52	Minneapolis, MN	B727	0	NONFATAL	0	SUBSTANTIAL	$453,359	$453,359
09/12/1988	53	Denver, CO	DC10	0	NONFATAL	0	SUBSTANTIAL	$732,348	$732,348
02/09/1989	54	Salt Lake City, UT	DC9	1	FATAL	0	NONE	$0	$3,000,000
03/31/1989	55	Syracuse, NY	1900C	0	NONFATAL	0	SUBSTANTIAL	$302,239	$302,239
03/31/1989	55		MU-2B		NONFATAL		SUBSTANTIAL	$278,990	$278,990
08/03/1989	56	Atlanta, GA	CV640	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
09/30/1989	57	Bemidji, MN	F-27	0	NONFATAL	0	SUBSTANTIAL	$244,116	$244,116
10/28/1989	58	Halawa, Molokai, HI	DHC-6	20	FATAL	0	DESTROYED	$511,481	$60,511,481
12/15/1989	59	Staunton, VA	BA-JETSTM3101	0	NONFATAL	0	SUBSTANTIAL	$197,618	$197,618
12/26/1989	60	Pasco, WA	BA-JETSTM3101	6	FATAL	0	DESTROYED	$1,453,072	$19,453,072
01/15/1990	61	Elko, NV	SA227	0	NONFATAL	4	SUBSTANTIAL	$162,744	$2,485,544
01/16/1990	62	New York, NY	B757	0	NONFATAL	0	SUBSTANTIAL	$5,719,293	$5,719,293
02/27/1990	63	Denver, CO	CE-208	1	FATAL	0	DESTROYED	$1,052,024	$4,052,024
03/29/1990	64	Chevak, AK	DHC-6	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
04/09/1990	65	Gasden, AL	EMB-120-RT	2	FATAL	0	SUBSTANTIAL	$278,990	$6,278,990
06/02/1990	66	Unalakleet, AK	B737	0	NONFATAL	1	DESTROYED	$9,346,162	$9,926,862
06/06/1990	67	Fresno, CA	CE-208	0	NONFATAL	1	DESTROYED	$1,052,024	$1,632,724
12/03/1990	68	Romulus, MI	DC9	8	FATAL	10	DESTROYED	$1,278,704	$31,085,704
12/03/1990	68		B727		NONFATAL		SUBSTANTIAL	$453,359	$453,359
01/30/1991	69	Beckley, WV	BAC BA-JETSTM	0	NONFATAL	13	DESTROYED	$4,463,838	$12,012,938
02/17/1991	70	Cleveland, OH	DC9	2	FATAL	0	DESTROYED	$1,278,704	$7,278,704
03/02/1991	71	Chicago, IL	360-100	0	NONFATAL	0	SUBSTANTIAL	$162,744	$162,744
03/12/1991	72	Jamaica, NY	DC8	0	NONFATAL	0	DESTROYED	$14,530,724	$14,530,724
10/05/1991	73	Little Rock, AR	B727	0	NONFATAL	1	NONE	$0	$580,700
01/03/1992	74	Gabriels, NY	1900C	2	FATAL	2	DESTROYED	$2,255,168	$9,416,568
02/24/1992	75	Anchorage, AK	DHC6-300	0	NONFATAL	0	SUBSTANTIAL	$116,246	$116,246
03/22/1992	76	Flushing, NY	F-28-4000	27	FATAL	9	DESTROYED	$3,661,742	$89,888,042
06/08/1992	77	Anniston, AL	BCH99	3	FATAL	3	DESTROYED	$2,034,301	$12,776,401
07/02/1992	78	Janesville, WI	B727	0	NONFATAL	1	NONE	$0	$580,700
07/30/1992	79	Jamaica, NY	L1011	0	NONFATAL	1	DESTROYED	$5,591,423	$6,172,123
10/20/1992	80	Dallas, TX	BA-JETSTM3101	0	NONFATAL	0	SUBSTANTIAL	$197,618	$197,618
11/13/1992	81	Atlanta, GA	B757	0	NONFATAL	1	NONE	$0	$580,700
11/22/1992	82	Cleveland, OH	Learjet	0	NONFATAL	0	SUBSTANTIAL	$9,300	$9,300
01/02/1993	83	Hibbing, MN	340A	0	NONFATAL	0	SUBSTANTIAL	$418,485	$418,485
03/17/1993	84	Beckley, WV	BA-JETSTM3101	0	NONFATAL	0	SUBSTANTIAL	$197,618	$197,618
04/26/1993	85	Miami, FL	B757	0	NONFATAL	1	NONE	$0	$580,700
04/29/1993	86	Pine Bluff, AR	EMB-120-RT	0	NONFATAL	0	SUBSTANTIAL	$278,990	$278,990
08/02/1993	87	Denver, CO	B757	0	NONFATAL	0	SUBSTANTIAL	$5,719,293	$5,719,293
08/18/1993	88	Guantanamo Bay, CB	DC8	0	NONFATAL	3	DESTROYED	$14,530,724	$16,272,824
08/25/1993	89	Andytown, FL	402C	0	NONFATAL	1	SUBSTANTIAL	$92,997	$673,697
11/15/1993	90	Chicago, IL	B727	0	NONFATAL	0	SUBSTANTIAL	$453,359	$453,359
12/01/1993	91	Hibbing, MN	JETSTM41	18	FATAL	0	DESTROYED	$1,453,072	$55,453,072
01/07/1994	92	Columbus, OH	BAC BA-JETSTM	5	FATAL	0	DESTROYED	$4,463,838	$19,463,838
01/07/1994	93	Columbus, OH	JETSTM41	5	FATAL	0	DESTROYED	$1,453,072	$16,453,072
01/26/1994	94	Mc Cook, NE	CE421	2	FATAL	3	DESTROYED	$389,423	$8,131,523
02/01/1994	95	New Roads, LA	340B	0	NONFATAL	0	SUBSTANTIAL	$964,840	$964,840
07/02/1994	96	Charlotte, NC	DC9	37	FATAL	16	DESTROYED	$1,278,704	$121,569,904
10/31/1994	97	Roselawn, IN	ATR	68	FATAL	0	DESTROYED	$6,905,000	$210,905,000
11/04/1994	98	Anchorage, AK	MD11	0	NONFATAL	0	SUBSTANTIAL	$13,286,894	$13,286,894
12/13/1994	99	Morrisville, NC	DC8	15	FATAL	5	DESTROYED	$14,530,724	$62,434,224

List of FAA Air Carrier Accident Findings: 1985 - 2004

Table G.1C Accident History									
DATE	COUNT	LOCATION	AIRCRAFT MODEL	FATALITIES	FTL/NONFTL	SERIOUS INJURIES	DAMAGE	AIRCRAFT DAMAGE COST	TOTAL COST OF ACCIDENTS
03/02/1995	1	Ardmore, OK	CE-208	0	NONFATAL	0	SUBSTANTIAL	$173,206	$173,206
04/13/1995	2	Denver, CO	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
07/28/1995	3	Dallas, TX	B737	0	NONFATAL	0	MINOR	$4,149,975	$4,149,975
07/28/1995	3		CE-401		NONFATAL		SUBSTANTIAL	$199,943	$199,943
11/12/1995	4	East Granby, CT	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
12/20/1995	5	Buga	B757	160	FATAL	4	DESTROYED	$42,383,215	$524,706,015
12/20/1995	6	Jamaica, NY	B747	0	NONFATAL	1	SUBSTANTIAL	$2,057,551	$2,638,251
02/07/1996	7	Bradford, PA	1900	0	NONFATAL	0	SUBSTANTIAL	$302,239	$302,239
02/19/1996	8	Houston, TX	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
02/20/1996	9	Fairbanks, AK	B757	0	NONFATAL	0	MINOR	$0	$0
02/20/1996	9		B757		NONFATAL		SUBSTANTIAL	$5,719,293	$5,719,293
02/22/1996	10	Miami, FL	B707	0	NONFATAL	0	MINOR	$34,874	$34,874
03/27/1996	11	Memphis, TN	B727	0	NONFATAL	0	SUBSTANTIAL	$453,359	$453,359
04/29/1996	12	Bernard, IA	CE421	3	FATAL	0	DESTROYED	$389,423	$9,389,423
05/16/1996	13	Anchorage, AK	MD11	0	NONFATAL	0	SUBSTANTIAL	$13,286,894	$13,286,894
06/06/1996	14	San Francisco, CA	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
06/06/1996	14		B767		NONFATAL		MINOR	$0	$0
07/08/1996	15	Nashville, TN	B737	0	NONFATAL	1	MINOR	$906,717	$1,487,417
07/13/1996	16	Westerly, RI	MD11	0	NONFATAL	1	NONE	$0	$580,700
08/25/1996	17	Jamaica, NY	L1011	0	NONFATAL	0	SUBSTANTIAL	$755,598	$755,598
01/01/1997	18	Kansas City, MO	Learjet	0	NONFATAL	0	SUBSTANTIAL	$9,300	$9,300
01/09/1997	19	Monroe, MI	EMB-120	29	FATAL	0	DESTROYED	$2,290,042	$89,290,042
01/10/1997	20	Bangor, ME	1900D	0	NONFATAL	0	SUBSTANTIAL	$592,854	$592,854
02/08/1997	21	St Thomas, VI	402C	2	FATAL	0	DESTROYED	$650,976	$6,650,976
03/05/1997	22	Cleveland, OH	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
03/14/1997	23	Detroit, MI	DC9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
03/26/1997	24	Wenatchee, WA	DHC-8	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
04/10/1997	25	Wainwright, AK	CE-208	5	FATAL	0	DESTROYED	$1,052,024	$16,052,024
04/28/1997	26	Atlanta, GA	B737	0	NONFATAL	1	NONE	$0	$580,700
08/07/1997	27	Miami, FL	DC8	5	FATAL	0	DESTROYED	$14,530,724	$29,530,724
01/20/1998	28	Grand Island, NE	CE-208	0	NONFATAL	0	SUBSTANTIAL	$173,206	$173,206
02/26/1998	29	Birmingham, AL	F28	0	NONFATAL	0	SUBSTANTIAL	$244,116	$244,116
03/05/1998	30	Clarksville, TN	CE-208	1	FATAL	0	DESTROYED	$1,052,024	$4,052,024
05/21/1998	31	Los Angeles, CA	DC10	0	NONFATAL	4	NONE	$0	$2,322,800
08/14/1998	32	Juneau, AK	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
11/11/1998	33	Portland, OR	MD11	0	NONFATAL	0	SUBSTANTIAL	$13,286,894	$13,286,894
12/17/1998	34	Traverse City, MI	ATR42	0	NONFATAL	0	SUBSTANTIAL	$929,966	$929,966
05/08/1999	35	Jamaica, NY	Saab 340B	0	NONFATAL	1	SUBSTANTIAL	$964,840	$1,545,540
06/01/1999	36	Little Rock, AR	MD82	11	FATAL	45	DESTROYED	$21,854,209	$80,985,709
06/02/1999	37	Phoenix, AZ	B757	0	NONFATAL	0	SUBSTANTIAL	$5,719,293	$5,719,293
07/15/1999	38	Jamaica, NY	A300	0	NONFATAL	0	SUBSTANTIAL	$54,554,150	$54,554,150
02/12/2000	39	San Salvador, El Salvador	B757	0	NONFATAL	0	SUBSTANTIAL	$5,719,293	$5,719,293
03/05/2000	40	Burbank, CA	B737	0	NONFATAL	0	DESTROYED	$9,346,162	$9,346,162
03/21/2000	41	Killeen, TX	Saab 340B	0	NONFATAL	0	SUBSTANTIAL	$964,840	$964,840
05/05/2000	42	Monument Valley, UT	DHC-6-300	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
05/09/2000	43	Maui, HI	L1011	0	NONFATAL	0	SUBSTANTIAL	$755,598	$755,598
06/14/2000	44	Lihue, Kauai, HI	DC-9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
07/02/2000	45	Orlando, FL	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
10/22/2000	46	Bethel, AK	BCH1900D	0	NONFATAL	0	SUBSTANTIAL	$592,854	$592,854
12/29/2000	47	Charlottesville, VA	J4101	0	NONFATAL	0	SUBSTANTIAL	$893,930	$893,930
02/06/2001	48	Boston, MA	F28	0	NONFATAL	0	SUBSTANTIAL	$244,116	$244,116
02/10/2001	49	Chicago, IL	BCH1900D	0	NONFATAL	0	SUBSTANTIAL	$592,854	$592,854
03/17/2001	50	Detroit, MI	A320	0	NONFATAL	0	SUBSTANTIAL	$36,652,298	$36,652,298
03/19/2001	51	West Palm Beach, FL	EMB120	0	NONFATAL	0	SUBSTANTIAL	$278,990	$278,990
06/15/2001	52	San Diego, CA	A320	0	NONFATAL	1	NONE	$0	$580,700
07/02/2001	53	Lake Minchumina	1340	0	NONFATAL	0	SUBSTANTIAL	$1,557,694	$1,557,694
08/25/2001	54	Kansas City, MO	B737	0	NONFATAL	0	SUBSTANTIAL	$4,149,975	$4,149,975
10/16/2001	55	Roanoke, VA	ERJ-145	0	NONFATAL	0	SUBSTANTIAL	$2,290,042	$2,290,042
11/12/2001	56	Belle Harbor, NY	A300	265	FATAL	0	DESTROYED	$9,043,923	$804,043,923
02/14/2002	57	Kotzebue, AK	B727	0	NONFATAL	0	SUBSTANTIAL	$453,359	$453,359
06/03/2002	58	Subic Bay, Philippines	MD11	0	NONFATAL	0	SUBSTANTIAL	$13,286,894	$13,286,894
06/16/2002	59	Kansas City, MO	DC-9	0	NONFATAL	0	SUBSTANTIAL	$174,369	$174,369
07/26/2002	60	Tallahassee, FL	B727	0	NONFATAL	3	DESTROYED	$3,382,753	$5,124,853
08/28/2002	61	Phoenix, AZ	A320	0	NONFATAL	1	SUBSTANTIAL	$4,952,071	$5,532,771
09/09/2002	62	Baltimore, MD	B757	0	NONFATAL	0	SUBSTANTIAL	$5,719,293	$5,719,293
01/06/2003	63	Cleveland, OH	ERJ-145	0	NONFATAL	0	SUBSTANTIAL	$2,290,042	$2,290,042
01/21/2003	64	Kipnuk, AK	DHC-6-200	0	NONFATAL	0	SUBSTANTIAL	$69,747	$69,747
12/18/2003	65	Memphis, TN	MD10	0	NONFATAL	0	DESTROYED	$10,008,763	$10,008,763
03/15/2004	66	Manhattan, KS	BCH1900D	0	NONFATAL	0	SUBSTANTIAL	$592,854	$592,854
05/09/2004	67	San Juan, PR	ATR72	0	NONFATAL	1	DESTROYED	$13,263,645	$13,844,345
08/30/2004	68	El Paso, TX	B727	0	NONFATAL	0	NONE	$0	$0
09/13/2004	69	Los Angeles, CA	B737	0	NONFATAL	1	NONE	$0	$580,700
10/19/2004	70	Kirksville, MO	J32	13	FATAL	2	DESTROYED	$2,313,291	$42,474,691
Totals	169			988		250		$515,317,593	$3,624,492,593

Source: FAA, Draft Regulatory Evaluation, Initial Regulatory Flexibility Determination, International Trade Impact Assessment, and Unfunded Mandates Assessment, May 2008, Appendix G.

The Adjusted Benefits from Reduction in Catastrophic Loss Is At Most $1.4 Million

Line	Item	Dollars in Millions	Source/ Comment
1.	(a) Cost of freighter aircraft loss:		This report, page 4-6.
	- Aircraft	$ 23.0	
	- Human lives (2 persons x $5.8 mm per life x 25% probability of loss of life)	2.9	PHMSA report, page 19.
	- Total	$ 25.9	
2.	(b) Cost of passenger aircraft loss:		This report, page 4-6.
	- Aircraft	$ 42.3	
	- Human lives (111 lives x $5.8 mm per life x 25% probability of loss of life)	161.0	PHMSA report, page 19.
	- Total	$203.3	
3.	(c) Weighted average cost at a freighter to passenger aircraft incident ratio of 16:1 =	$ 36.3	Exhibit 4-1
4.	Assumed probability of accident occurrence during the next 10 years =	5%	CAC/TranSystems assumption solely for purposes of this calculation. There have been no historical aircraft accidents attributable to lithium or lithium ion batteries
5.	Assume this accident occurs at the mid-point of the next 10 years	5th year	
6.	Present value of the cost of this hypothetical aircraft accident:		
	$36.3 million x 5% x 0.763[2] =	$1.4 Million	

[2] This is the present value of $1.00 discounted for four years at a 7% discount rate.

HAZARDOUS MATERIAL FIRE INCIDENTS ON U.S. AIRCRAFT
(1998 - 2009)

		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	12-Year Total	Annual Average
Number of Incidents															
Lithium Battery-Related	1/	0	0	0	0	2	0	1	2	3	4	1	4	17	1.4
Other		6	7	4	8	8	2	1	0	3	3	3	2	47	3.9
		6	7	4	8	10	2	2	2	6	7	4	6	64	5.3
Lithium Battery Share of Total														27%	
Total Damages															
Lithium Battery-Related	1/	$0	$0	$0	$0	$0	$0	$67,000	$0	$0	$0	$0	$37,000	$104,000	$8,667
Other		$0	$130	$42,239	$0	$300,050	$1	$10,000	$0	$0	$0	$0	$0	$352,420	$29,368
		$0	$130	$42,239	$0	$300,050	$1	$77,000	$0	$0	$0	$0	$37,000	$456,420	$38,035
Lithium Battery Share of Total														23%	
Average Damages per Incident															
Lithium Battery-Related	1/	$0	$0	$0	$0	$0	$0	$67,000	$0	$0	$0	$0	$9,250	$6,118	$6,118
Other		$0	$19	$10,560	$0	$37,506	$1	$10,000	$0	$0	$0	$0	$0	$7,498	$7,498
		$0	$19	$10,560	$0	$30,005	$1	$38,500	$0	$0	$0	$0	$6,167	$7,132	$7,132
Lithium Battery Share of Total														86%	

1/ Includes all incidents for which the commodity description included the word "lithium".

Note: Database was queried for all incidents where "Mode of Transportation" was "Air" and "Result of Incident" was "Fire".

Source: PHMSA, Office of Hazardous Materials Safety, Incidents Report Database (February 19, 2010 version)

COMPARISON OF ESTIMATED COSTS, BENEFITS AND BENEFIT-COST RATIOS

	PHMSA Methodology						CAC/TranSystems Methodology					
	BCA Estimates			CAC/TranSystems Corrections			With No Growth			With 5% Annual Growth		
	Benefits	Costs	Benefit-to-Cost Ratio	Benefits	Costs	Benefit-to-Cost Ratio	Benefits	Costs	Benefit-to-Cost Ratio	Benefits	Costs	Benefit-to-Cost Ratio
Year 1	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0010	$1,127.08	
Year 2	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0011	$1,183.43	
Year 3	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0011	$1,242.60	
Year 4	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0012	$1,304.73	
Year 5	$10.00	$9.39		$10.00	$25.52		$1.8160	$1,127.08		$2.2074	$1,369.97	
Year 6	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0013	$1,438.47	
Year 7	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0013	$1,510.39	
Year 8	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0014	$1,585.91	
Year 9	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0015	$1,665.21	
Year 10	$10.00	$9.39		$10.00	$25.52		$0.0010	$1,127.08		$0.0016	$1,748.47	
10-Year Present Value												
at 3% Discount Rate	$87.86	$82.50	1.06	$87.86	$224.23	0.392	$1.6200	$9,902.62	0.0002	$1.9700	$12,308.36	0.0002
at 7% Discount Rate	$75.15	$70.57	1.06	$75.15	$191.80	0.392	$1.3900	$8,470.24	0.0002	$1.6900	$10,368.50	0.0002

Source: Exhibits 3-11 and 4-5

COMPARISON OF PHMSA AND CAC/TRANSYSTEMS ESTIMATES OF BENEFITS AND COSTS

		10-Year NPV	
	Base Year	3% Discount	7% Discount
A. BENEFITS			
PHMSA Estimate	$\boxed{\$10.00}$	$87.86	$75.15
CAC/TSC Estimate *	$0.18	$1.62	$1.39
B. COSTS			
PHMSA Estimate			
Packaging	$8.67	$76.18	$65.16
Training	$0.67	$5.89	$5.04
Information Collection	$0.05	$0.44	$0.38
	$9.39	$82.50	$70.57
CAC/TSC Correction to PHMSA Estimate			
Packaging	$22.92	$201.39	$172.26
Training	$2.55	$22.40	$19.16
Information Collection	$0.05	$0.44	$0.38
	$25.52	$224.23	$191.80
Net Change to PHMSA Estimates	$16.13	$141.73	$121.23
Industry-Based Estimate			
U.S. Trade			
Packaging	$182.43	$1,602.81	$1,370.97
Training	$4.74	$41.65	$35.63
Air Transport and Other Services	$338.58	$2,974.83	$2,544.53
Inventory	$377.80	$3,319.39	$2,839.26
	$903.55	$7,938.68	$6,790.38
Foreign-to-Foreign Trade	$223.53	$1,963.93	$1,679.86
	$1,127.08	$9,902.62	$8,470.24
Net Change to PHMSA Estimates	$1,117.69	$9,820.11	$8,399.67
C. BENEFIT-COST RATIOS			
With Benefit Adjustments Only		0.02 to 1.00	0.02 to 1.00
With Cost Corrections Only		0.39 to 1.00	0.39 to 1.00
With Benefit Adjustments and Industry-Based Costs		0 to 1.00	0 to 1.00

* Based on $1,600 per year and $1.4 million for Year 5 averaged over 10 years.