IATA/ASF
Airline Waste Analysis Methodology

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1. BACKGROUND

The sustainable management of waste generated in the cabin is a growing challenge for airlines. Previous research commissioned by the International Air Transport Association (IATA) in 2014 indicated that there is little information about cabin waste, with no consolidated data on cabin waste composition or waste management costs. There is also a lack of harmonization across the sector on the methodology and classification of cabin and catering waste.[1] Whilst the 2014 study resulted in a trial at Heathrow Airport in London, the methodology used to analyze all waste generated from the aircraft needed to be updated, and a standardized method of conducting a Cabin Waste Composition Audit (CWCA) is to be developed for the sector.

In November 2023, IATA and the Aviation Sustainability Forum (ASF) developed a trial program to refine the Airline Waste Analysis Methodology and define a standardized approach for the aviation sector. Six audits were conducted, looking into short-haul and medium-haul flights, arriving at Changi Airport, Singapore. In March 2024, the trials were expanded, incorporating long-haul flights and reaching a total of 25 audits conducted that served as the basis to establish this methodology.

IATA and the ASF have developed a standard methodology that aims to provide harmonized guidance when analyzing the waste streams and material categories that need to be measured. This will assist airlines in quantifying cabin waste and using the resulting data to reduce current waste levels and improve remaining waste circularity. The methodology can be used by airlines when conducting their own internal analysis.

The ASF, having co-developed this methodology, are trained in accordance with it, thus making them well-positioned to conduct the CWCA. When airlines choose to participate in the ASF CWCA Program, the ASF will coordinate and conduct the full completion of the audits and gather all the information. Also, the flights audited by the ASF will have their data included in the ASF Platform, and airlines will have easy access to their data in a standard formatted flow to build different dashboards. The ASF Platform enables individual airlines to benchmark against other anonymized data included there.

2. TERMINOLOGY

Cleaning waste – Materials collected by aircraft interior cleaning companies from seatback pockets and the cabin floor, and toilet bin waste. This can also include compactor boxes and static waste bins (if applicable).

Pre-segregated recyclables – Segregated or co-mingled recyclable materials (glass, paper, aluminum cans, PET bottles/cups & beverage cartons) that are collected on-board by the crew during inflight operations.

Catering (galley) waste – Materials collected by appointed caterers as part of the de-catering process, including waste carts (or bags), food carts & bonded carts, and compactor boxes (if applicable).

[1] IATA Cabin Waste Handbook, 2019.

3. SCOPE

This methodology seeks to establish the total weight of each specified material category and to map the waste pathway that those categories follow from aircraft offload to disposal or recovery.

The data generated from the waste composition analysis will establish the relative weight of material recovered (or weight of waste with potential to be recovered) in each waste stream identified (cleaning waste, pre-segregated recyclables, and catering waste), including a further breakdown of the material composition of each of these waste streams, considering the categories detailed below. See Appendix 1 for material composition terminology.

(3.1) Cleaning waste

Waste generated by passenger service provision, including Food and Beverage (F&B) items brought onto the aircraft by passengers:

(3.1.1) Opened beverages

(1) Aluminum cans (opened) – liquid removed.
(2) Glass (opened) – liquid removed.
(3) PET/RPET bottles (opened) – liquid removed.
(4) Paper bottles (opened) – liquid removed.
(5) Composite beverage cartons (opened) – liquid removed.
(6) Liquid (from opened beverages).

(3.1.2) Sealed beverages

(1) Aluminum cans (sealed).
(2) Glass (sealed).
(3) PET/RPET bottles (sealed).
(4) Paper bottles (sealed).
(5) Composite beverage cartons (sealed).

(3.1.3) Opened food and disposable cutlery

(1) Cutlery kits (wood, bamboo, plastic, chopsticks, pre-identified bio-based, etc.) (opened).
(2) Food packaging (food waste removed).
(3) Food waste:
    i. Loose food items (no packaging).
    ii. Opened airline-provided meal service packaging.

(3.1.4) Sealed food and disposable cutlery

(1) Cutlery kits (wood, bamboo, plastic, chopsticks, pre-identified bio-based, etc.) (Sealed)
(2) Food packaging and food (sealed)

(3.1.5) Waste from passenger items

(1) Any clearly identifiable residual food and beverage items and packaging brought onto the aircraft by passengers (distinguishable from airline-provided products) which include animal protein.

(3.1.6) Soft items and amenity kits provided by the airline

(1) Opened amenity kits, headphones, and textiles (eye covers, pajamas, socks, slippers, etc.).
(2) Sealed amenity kits, headphones, and textiles (eye covers, pajamas, socks, slippers, etc.).
(3) Disposable airline items (separated per cabin):
    i. Headrest covers.
    ii. Pillow covers.
    iii. Other.

(3.1.7) Toilet bin waste (in sealed bags collected for each audited flight)

(3.1.8) Paper (including newspapers & magazines - not food service packaging)

(3.1.9) Other

(3.2) Pre-segregated recyclables

Pre-segregated recyclables are identified for the airlines that have an onboard segregation procedure for recyclable items.

(3.2.1) Co-mingled recyclables (where recyclables are mixed and not separated by crew these are weighed and photographed prior to being separated into each of 2 –7 below).
(3.2.2) Aluminum cans (empty).
(3.2.3) Glass (empty).
(3.2.4) PET/RPET bottles (empty).
(3.2.5) Composite beverage cartons (empty).
(3.2.6) Paper (including newspapers, magazines & pamphlets - not food service packaging).
(3.2.7) Other (as defined in the onboard segregation procedures).

(3.3) Catering waste

(3.3.1) Opened beverages

(1) Aluminum cans (opened) – liquid removed.
(2) Glass (opened) – liquid removed.
(3) PET/RPET bottles (opened) – liquid removed.
(4) Paper bottles (opened) – liquid removed.
(5) Composite beverage cartons (opened) – liquid removed.
(6) Liquid (from opened beverages.

(3.3.2) Sealed beverages

(1) Aluminum cans (sealed).
(2) Glass (sealed).
(3) PET/RPET bottles (sealed).
(4) Paper bottles (sealed).
(5) Composite beverage cartons (sealed).

(3.3.3) Opened food and disposable cutlery

(1) Aluminum meal foil dishes (opened) – food removed.
(2) Aluminum meal foil lids (opened) – food removed.

(3) PET/RPET/ bio-plastics meal dishes (opened and by type) – food removed.
(4) Paper-based meal dishes (Opened) – food removed.
(5) Cutlery kits (wood, bamboo, plastic, chopsticks, pre-identified bio-based, etc.) (opened).
(6) Paper food packaging (opened) – food removed.
(7) Plastic food films (opened) – food removed.
(8) PET/ Plastic composites/ pre-identified bioplastics (opened) – food removed.
(9) Food waste:
    i. Loose food items (no packaging).
    ii. Opened airline meal service packaging.

(3.3.4) Sealed food and disposable cutlery

(1) Aluminum Catering Meals (sealed).
(2) PET/RPET/ Bio-plastics meal dishes (sealed and by type).
(3) Paper-based meal dishes (sealed).
(4) Cutlery Kits (wood, bamboo, plastic, chopsticks, pre-identified bio-based, etc.) (sealed).
(5) Paper food packaging (sealed).
(6) Plastic food films (sealed).
(7) PET/ Plastic composites/ pre-identified bioplastics (sealed).
(8) Pre-packed meal accompaniments e.g., butter packs (sealed).

(3.3.5) Used beverage cups

(1) Paper-based cups (used).
(2) Plastic cups (used).

(3.3.6) Unused beverage cups

(1) Paper-based cups (unused).
(2) Plastic cups (unused).

(3.3.7) Paper (including newspapers & magazines - not food service packaging)

(3.3.8) Other

4. METHODOLOGY

The methodology to audit all aircraft cabin waste generated from a single flight should consist of one single process, considering the eight most common locations (if present) for waste stowage on the aircraft, with the objective to separate, weigh, and categorize the waste found at each of these locations. See Appendix 2 for waste locations terminology.

(1) Cleaning waste (contained within clear bin liners and including amenities).
(2) Toilet waste (contained within clear labeled bin liners).
(3) Compactor boxes.
(4) Pre-segregated recyclables.
(5) Galley waste (waste that has not been put in the galley carts but bagged).
(6) Economy/Premium Economy galley carts.
(7) Business/ First galley carts.
(8) Bonded carts.

(4.1) Coordination and preparation

Prior to starting the audits, the airline needs to advise all service partners (i.e., caterers, cleaners, etc.), internal (i.e., cabin crew, responsible at landing station, etc.), and external stakeholders (i.e., regulators, etc.) that the audits will take place. Coordination of timings and actions is required with all appointed stakeholders, especially catering units and cabin cleaning operators who will need to work together and in accordance with local regulatory frameworks, particularly for the handling of International Catering Waste (ICW). Jurisdiction guidance must be sought, and approval given by the regulating authority to open and analyze the aircraft cabin waste generated.

For optimum results, both streams of waste (cleaning and catering) should be audited in one common location and within an inbound area fully contained indoors to eradicate foreign object debris (FOD). Conducting the audits at the appointed catering facility seems to be the best solution.

Transportation of cleaning waste to the appointed location can happen either by the waste being transported by the cleaning contractor or by the caterer collecting all aircraft cabin waste. This may need additional approval from local regulators at the port of arrival.

It is required to match all aircraft cabin waste streams to the flight number that will be audited. This should be done by labeling the cleaning waste bags, toilet waste bags, galley waste bags, and pre-segregated recyclables before they leave the aircraft.

(4.2) Information needed

It is recommended that the airline gathers further information to be more accurate on the data collected during the audits. This will allow to contrast and compare waste weights with the menus and weights being loaded. All information is specified in Appendix 3 including:

- Contacts for airline, caterers, and cabin cleaners.
- Flight information, including flight number, aircraft type, arrival time, and occupancy.
- Cabin manifest (in English) and packaging information.
- Crew pre-segregated recyclables process, including the location of the recyclables to be captured.
- Amenity kits loading.
- Any changes to the flight details or loading.
- Any delays to the flight.

(4.3) Audit and data collection

The cabin cleaning and the de-catering processes of the nominated flight at the designated airport should be conducted as normal, and when complete, waste should be processed as pre-agreed in the plan (either handed over to the catering vehicle or transported directly to the catering unit or the appointed location).

The cleaning waste (contained in clear bin liners) and the toilet waste (contained in clear labelled bin liners) should be banded or tied together, and the flight number added. Then, it should be placed into the designated appointed location.

Catering waste recovered from the nominated flight by the airline caterer should be recovered and taken to the catering facility per normal operations (or transferred to the appointed location) and set aside for analysis. Operations must be compliant with required legislation regarding the presence of ICW.

The segregated recyclables can be collected by the aircraft cleaner or the caterer depending on the procedure of the airline.

The nominated flight should be met at the appointed location by the supervisor or responsible person for the audit, who will have already set up the audit area for receipt of waste and briefed the audit team on their roles in the audit process.

The floor should be covered with a protective sheet to prevent direct contact of any material with the ground.

All waste should be segregated by the process given below into the categories mentioned, recording:

1. Source -location of waste in the cabin.
2. Category - type and weight.
3. Images.

The audit should be able to establish the percentage of recyclable material currently being lost due to ICW contamination for all waste streams. The data set presented should also indicate the percentages 'clean' and 'contaminated' for these categories.

(4.3.1) Cleaning waste

When analyzing the cleaning waste stream, the appointed location needs to be split into a 'clean' (uncontaminated waste sacks) and a 'dirty' (ICW contaminated waste sacks) side. As stipulated by the regulator, each waste sack generated from the cleaning waste stream needs to be checked for ICW contamination. Once this process has been completed, the waste sacks on sides can be analyzed and weighed.

The audit should provide for a further analysis of sealed food & beverages, sealed amenity kits, headphones, and textiles, recording the number and type of each item discarded (where feasible). Please refer to section 3.1 for a detailed breakdown of material categories into which cabin waste will be segregated.

Toilet waste contained within clear bin liners, already labeled accordingly, is hazardous and shall not be opened. These bags are to be photographed externally and weighed only. All toilet waste bags shall be disposed of immediately according to normal procedures following what is established in the regulations.

(4.3.2) Pre-segregated recyclables

Crew pre-segregated recyclables should be identified for those airlines that operate a process onboard.

The weight of each of the material categories defined in section 3.2 should be recorded to allow for a comparison of total material category offloaded from the flight versus that

recovered by crew. A visual assessment should also be recorded to determine whether the recovered recyclable material has been contaminated with food waste and, therefore, designated as ICW if local applicable jurisdiction regulations require it to do so. This process also allows the establishment of the success rate of onboard recycling programs.

Co-mingled recyclables (where recyclables are mixed and not separated by item by the crew onboard) should be weighed and photographed prior to being separated per type. If segregation per type is done on board the aircraft by the crew, this should be registered as such.

(4.3.3) Catering waste

Catering Waste from the nominated flight is to be recovered and taken to the catering unit or appointed audit facility and set aside during the audit, with the objective to record the weight and composition of the Catering Waste at each of the following locations:

(1) Compactor boxes (where applicable).
(2) Galley waste (contained within clear bin liners within or outside galley bin carts).
(3) Economy/Premium Economy galley carts.
(4) Business/First galley carts.
(5) Bonded carts.

The weight of the material categories described in section 3.3 should be recorded separately and allocated to each location mentioned above.

(4.3.4) Recording sealed food and beverage items

All sealed food and beverage items should be recorded at item level to capture the number of items, packaging weight, and content weight.

Sealed aluminum cans, composite paper beverage cartons, glass bottles, PET/RPET bottles, paper bottles, and uncontaminated food & beverages recovered from the galley carts and bonded carts that are suitable for re-use are not to be classed as waste for the purpose of the study.

Any items the airline has instructed the caterer to salvage from the carts (food & beverages and Bonded) are not classified as waste, however all non-spec (not categorized in the audit) or contaminated sealed food & beverages should be classified as waste, given that the products will not be re-used.

All non-spec (not categorized in the audit) or contaminated sealed food & beverages recovered from the food and bonded carts shall be treated according to local regulations.

(4.4) Waste disposal

All waste categories shall be disposed of through the current procedures of disposal at the appointed location, and according to local regulations.

Cleaning of the allocated space by the team shall follow the completion of the audit.

APPENDIX 1 – MATERIAL COMPOSITION

Aluminum	Aluminum cans and entrée meal dishes plus aluminum foil trays and lids from which food and liquid has been removed (with the contents being categorized as **Food waste** or **Liquid**)
Composite Paper Beverage Cartons	Beverage cartons (comprising paperboard, low-density polyethylene, and aluminum foil – depending on application for long or short shelf-life products), from which liquid has been removed (with the contents being categorized as **Liquid**)
PET / RPET (HDPE) Bottles	Plastic bottles (predominantly PET or RPET), from which liquid has been removed (with the contents being categorized as **Liquid**).
Glass Bottles	Glass bottles, from which liquid has been removed (with the contents being categorized as **Liquid**).
Cutlery Sets – All	Wood, bamboo, plastic, chopsticks, pre-identified bio-based kits.
Liquid - Opened	Liquid removed from opened (i.e., where the seal has been broken) aluminum cans, composite paper beverage cartons, PET (HDPE) bottles, and glass bottles, as categorized above.
Liquid - Sealed	Unopened beverage items (i.e., where the seal has not been broken) that are sealed within disposable (i.e., single-use) food service packaging.
Food Waste – Sealed	Unopened food items (i.e. where the seal has not been broken) that are sealed within **disposable** (i.e. single-use) food service packaging.
Food Waste – Loose. (Removed from packaging & rotables)	Loose food waste recovered from waste sacks or carts, removed from opened (i.e., where the seal has been broken) disposable (i.e., single-use) food service packaging, and removed from tables.
Hard Plastic	Hard plastic packaging used for food service packaging and beverage packaging (excluding PET or RPET Bottles)
Plastic Food Film	All plastic film packaging, incorporating disposable (i.e., single-use) food service packaging
Paper	All paper, incorporating newspapers, magazines and pamphlets, and food packaging.
Amenity Kits, Headphones, and Textiles – Sealed	Unopened (i.e., sealed within disposable packaging) amenity kits, headphone sets, and textiles (blankets and clothing).
Amenity Kits, Headphones, and Textiles – Loose	Opened (i.e., where the seal has been broken) amenity kits, headphone sets, and textiles (blankets and clothing).
Toilet Waste	Solid waste generated from the bins in the aircraft washrooms.
Other	Any item not categorized above.

APPENDIX 2 – WASTE LOCATIONS

(1) Cleaning Waste	**Removed by aircraft cleaners only**. Waste generated by passengers from items placed in seatback pockets and dropped on the cabin floor. To determine the potential for recycling, this category has been divided into the following: ICW contaminated waste ('dirty') and uncontaminated waste ('clean').
(2) Toilet Waste	**Removed by aircraft cleaners only**. Solid waste generated from the bins in the aircraft washrooms. Photographed but not analyzed due to hazard risk.
(3) Compactor Boxes	**Removed by aircraft caterer**. Waste collected (and compacted) in cardboard compactor boxes located in the galley and used predominantly to dispose of food service packaging.
(4) Pre-Segregated Recyclables	**Removed by aircraft caterer**. Segregated or co-mingled recyclable materials (aluminum cans, beverage cartons, glass bottles, paper, plastic (PET/HDPE) bottles & plastic cups) separated by the crew at source as part of inflight operations.
(5) Galley Waste	**Removed by aircraft caterer**. Waste collected in static waste bins located in the galley and used predominantly to dispose of food service packaging. Removed in plastic waste sacks taken from a permanent bin housing or from a waste cart (lined with a plastic waste sack).
(6&7) Galley Carts – Food & Beverages	**Removed by aircraft caterer**. Waste collected in carts used to serve food and beverages – not including bonded carts.
(8) Carts – Bonded	**Removed by aircraft caterer**. Waste collected in bonded carts – dedicated to dutiable landed imports that are stored under the supervision of customs authorities in bonded warehouses.

APPENDIX 3 – INFORMATION REQUIRED

Airline Contact:

- Name:
- Job Title:
- Mobile:
- Email:

Flight Arrivals into the designated airport

Please list all flights that will take part in the audits. Flights selected should represent a balance/median of passenger loads across all cabin classes are preferred.

FLIGHT NUMBER	**Aircraft Type**	**Departing from**	**Departure time**	**Arrival time**	**No. Economy Cabin Seats**	**No. Premium Economy Cabin Seats**	**No. Business Class Cabin Seats**	**No. First Class Cabin Seats**

Meal & Bar Service Menus:

Please provide the following as cabin manifests or menu cards for each of the audited flights **ten working days** prior to the departure of the flight to be audited.

CABIN	**Meal Service 1** Menu	**Bar 1** Drinks & Snacks Offer	**Meal Service 2** Menu	**Bar 2** Drinks & Snacks Offer	**Meal Service 3** Menu	**Bar 3** Drinks & Snacks Offer
Economy						
Premium Economy						
Business Class						
First Class						

(Where a snack service is offered instead of a meal service, please amend the table above and insert details of the snack service and any associated beverage service).

Pre-Segregated Recyclables

Does the crew currently segregate recyclables on international flights? If yes, please advise which materials are segregated:

CABIN	**Aluminum Cans (Y/N)**	**PET Bottles (Y/N)**	**Glass (Y/N)**	**Paper (Y/N)**	**Other**
Economy					
Premium Economy					
Business Class					
First Class					

Pre-identified Bio-based Food & Beverage materials:

To assist with the audit, please provide details of all Food and Beverage materials by cabin that use bio-based materials for packaging of any food or beverage item instead of Paper, PET, RPET, Composite Plastics, Glass and metal/ aluminum. (Please include bioplastics):

CABIN	ITEM DESCRIPTION	MATERIAL USED	DETAILS OF ANY IDENTIFYABLE LABEL

Segregated Compacting:
Please advise if crew complete any compacting of segregated waste:

Material	Yes/ No
Metal/ Aluminum Cans	
PET/HDPE/RPET bottles	
Paper	
Glass	
Other. Please specify:……	

Information To Be Provided at Time Of Departure For Selected Flight for Audit

Meal Load Factor
For Economy and Premium Economy, the meal load factor* by menu option.
For Business and First Class the catering manifest of meal and beverage items to include loads.
*(*Where Load Factor = the percentage of seats in each cabin).*

CABIN	Load Factor Meals	Load Factor Beverages
Economy		
Premium Economy		
Business Class		
First Class		
Add comments		

Amenity kit load factor
Load factor* for each cabin class:
*(*Where Load Factor = the percentage of seats in each cabin).*

CABIN	Load Factor Headsets	Load Factor Amenity Kits
Economy		
Premium Economy		
Business Class		
First Class		

Passenger Numbers by Cabin:
Please provide details of the number of passengers that were boarded in each cabin at time of departure:

CABIN	Number of Seats	No. of Confirmed Passengers
Economy		
Premium Economy		
Business Class		
First Class		

Information to be provided within 72 hours of flight arrival at designated Airport for Selected Flight for Audit

Flight Delays
Please provide written details of any delay or load changes made to the flight or additional passenger loading due to missed connections:

Audit Flight Number	Length of delay on departure	Reason for delay	Details of any changes to meal, beverage, snack or amenity kit loading to that provided at point

Adjusted Meal Load Factor
For Economy and Premium Economy, the meal load factor* by menu option.
For Business and First Class the catering manifest of meal and beverage items to include loads.
*(*Where Load Factor = the percentage of seats in each cabin).*

CABIN	Load Factor Meals	Load Factor Beverages
Economy		
Premium Economy		
Business Class		
First Class		
Add comments		

Adjusted Amenity kit load factor.
Load factor* for each cabin class:
*(*Where Load Factor = the percentage of seats in each cabin).*

CABIN	Load Factor Headsets	Load factor Amenity Kits
Economy		
Premium Economy		
Business Class		
First Class		

Adjusted Passenger Numbers by Cabin:
Please provide details of the number of passengers that were boarded in each cabin at time of departure:

CABIN	Number Of Passengers
Economy	
Premium Economy	
Business Class	
First Class	