

# Public Survey on New In-Flight Food Delivery and Waste Collection System

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## ABSTRACT

*The market competition in commercial air transportation industry today is very intense and many airlines are forced to search for new ways to attract potential passengers to their offered flight services. A few studies have shown that service quality is one of the key factors that influence passengers' loyalty to an airline. This includes particularly the in-flight services, which are the main opportunities for airlines to make good impression to their passengers with regards to their overall service. The in-flight food delivery and waste collection process is the primary interest of this study. It is believed that the current manual process of delivering food to passengers and collecting waste afterwards can be significantly improved by automating the process. A public survey is conducted at two major international airports in Malaysia to obtain feedback from the passengers regarding the current and proposed automated food delivery and waste collection processes. Overall, it can be taken that the public has responded positively to the idea. In addition, some characteristics of the proposed process are also established from the survey results, which can be applied when designing and developing the new system.*

**Keywords:** *in-flight service, food delivery, waste collection, public survey, commercial transport.*

## **Introduction**

Commercial air transportation industry has become very competitive today. After the US Airline Deregulation Act in 1978, many low cost airlines have emerged around the world, including in the US, Europe and Asia, but many have unfortunately also been out of the business [1]. In spite of continued growth in global airline industry for both low cost and full service airlines, their profit margins are very small, less than three percent overall [2]. To survive the intense market competition, all airlines are forced to find ways to reduce their operating costs and increase revenues through better customer interactions. As established in a study, the image of the airlines significantly contributes to their passenger loyalty and in some cases, this criterion is more vital than the offered ticket price when the passengers considering their travel options [3]. Maintaining and improving their service quality has been the key competitive means for airlines in attracting passengers from their competitors [4]. Therefore, it is essential for each airline to differentiate themselves from other competing airlines by providing a better service quality.

In-flight services are among the key airline services that can primarily shape the passengers' perception of the overall airline's service quality [5]. This is especially true because the quality of these services can influence the passengers' flight experiences and most of them are conducted face-to-face by the cabin and flight crew, which gives more impact to passengers' memory of the flight trip. Hence active in-flight services like food delivery and waste collection should be ensured to be of good quality. Indeed, a published study has highlighted that passengers tend to choose airlines with the best quality of in-flight food services for their travel [6].

Current in-flight food delivery and waste collection services are done manually by the cabin crew. As illustrated in Figure 1, the manual process of delivering food to passengers and collecting the resultant waste from them afterwards is executed using the service trolleys or carts. Food and beverages are prepared within the galley area before being transported using the trolleys along the cabin aisle to be distributed to the passengers. After an allocated time frame for passengers to finish enjoying their meals, the cabin crew will once again push the service trolley along the aisle to collect the meal trays and waste. Another trip of the service trolley is also typically made to serve hot drinks before the waste collection trip. For short haul flights, the in-flight meal service often involves only one service trolley trip to distribute light snacks and drinks to the passengers, and another trip to collect the waste afterwards. On the other hand, the food delivery and waste collection process is commonly repeated two or three times in long haul flights. It should be noted that cabin crew often have to make additional trips along the aisle with plastic bags to collect remaining waste materials from the passengers before the aircraft lands.

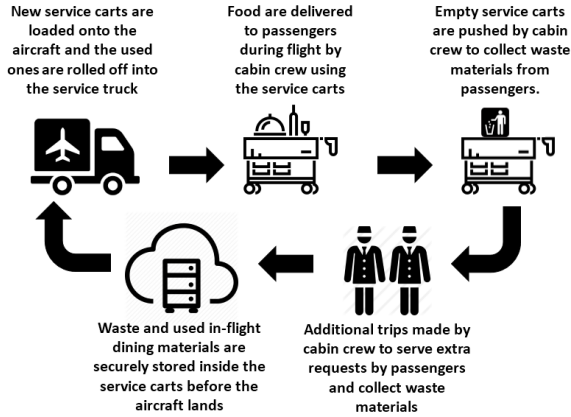


Figure 1: Current manual food delivery and waste collection process

It is believed that big improvements can be made to this manual food delivery and waste collection process by automating it. Based on an online survey done to obtain feedback from the public regarding the possibility of implementing automated food delivery and waste collection system onboard the commercial transport aircraft, the responses are taken to be very positive [7]. This study aims to further support this assertion by conducting face-to-face public survey on the matter and the results are presented in subsequent sections of this paper.

## The Proposed Automated Process

Before the results of the conducted public survey are presented, it is good to describe the proposed automated process to replace the current manual in-flight food delivery and waste collection process. Figure 2 demonstrates the general intended flow of the automated process that has been conveyed to the survey participants.

There are indeed several designs and proposals for food delivery and waste collection system that have been made in previous years for use in the commercial transport aircraft. Among the earliest patented designs is the one filed in 1965[8]. This invention of "moving cabinet" closely resembles and it is applied in similar fashion to the current food service carts. The only main difference is that the cabinet is supported by tracks along the aisle to ease its movement. This invention is not automated as it still needs to be operated manually by the cabin crew. There is a patented automated system design for food delivery and waste collection onboard the aircraft that has been filed in 2016 [9]. In this invention, meals are delivered and wastes are collected to and from the passengers through a conveyor system within or underneath the cabin

floor. The outlet for this system is anticipated to be placed at the aisle seats of each row, requiring the occupants of those seats to help the other passengers in the same seat row to get the meal or discard the waste materials afterwards. The overall concept envisioned in this study is practically similar to the one proposed in this patent although details of the mechanisms to be used have yet to be explored. It should be noted that, as to date, none of the patented systems has been successfully applied and implemented onboard the commercial transport aircraft.

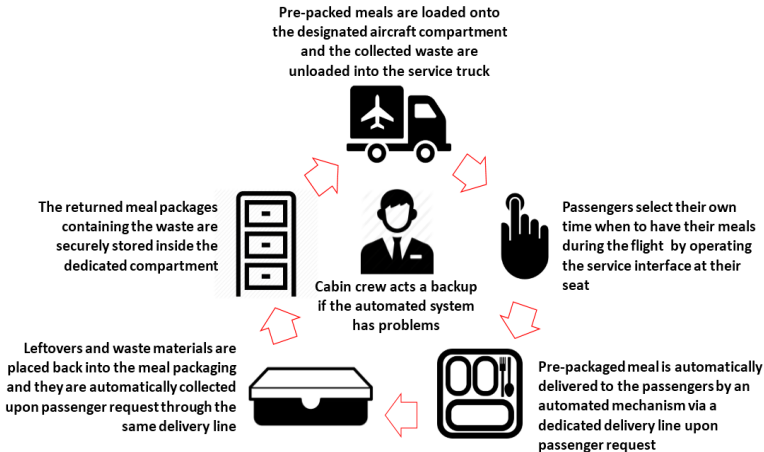


Figure 2: Proposed automated food delivery and waste collection process

### Benefits of the Automated Process

The pursuit of the automated food delivery and waste collection process is based on several expected advantages to both passengers and airlines. For the current manual process, some inconveniences to the passengers and cabin crew have been established and they are aimed to be resolved or alleviated by the proposed automated process. A summarized discussion on several of the major benefits of having the automated food delivery and waste collection process is presented in Table 1. These perceived problems are also included in the survey questionnaire for the respondents to validate them as real issues based on their own flight travel experiences.

### Public Survey: Results and Discussions

This public survey is conducted at two international airports in Malaysia: Kuala Lumpur International Airport (KLIA) and Penang International Airport (PIA). The questions for the survey have been designed to obtain feedback on

Table 1: Potential benefits or improvements by the automated process

<b>Process Characteristics</b>	<b>Current Manual Process</b>	<b>Proposed Automated Process</b>
Meal Serving Time	Meals are served by the cabin crew in the designated timeframe during flight and passengers have to follow this schedule.	Passengers can enjoy their meals at their own leisure within the allowable time during flight (the system should be disabled during take-off, landing and severe flight turbulence).
Waiting Time To Be Served	Passengers are being served by their seat row and will have to wait their turn. In some cases of severe turbulence for short haul flights, some passengers in the last serving rows might miss their meals. Plus, meal options may be limited for the last passengers to be served.	Passengers can have their meal in a short time after their request to the automated system and do not have to wait in turns. There will be no case of having to miss their meals. The meals have to be pre-determined during booking, thus avoiding cases of unavailable meal options.
Accidental Risk	Spillage of hot meals and drinks on the passengers seated in the same row when serving the other passengers (especially on passengers seated in the aisle seats).	The meals are served direct to the passengers and interaction with the other passengers is reduced to minimal. This reduces any accidental risk during meal serving.
Privacy	Passengers in the same row might be disturbed from their rest during the meal serving process, even when they do not intend to have any meal.	The meals are served direct to the passengers and interaction with the other passengers is reduced to minimal.
Cabin Movement	Movement along the aisle is restricted during the meal serving process due to blocking of the serving carts.	No serving cart is involved and the aisle is not blocked during the meal serving process.

the quality of service for current food delivery and waste collection process onboard commercial flights and to establish any potential improvement to the process that will make it better suited to the passengers' needs. In general, 16 questions in the survey can be grouped into three main sections. The first section primarily covers the respondents' demographic information like age, gender, etc. This information is useful to classify representative group of the respondents within the general public in Malaysia. Meanwhile, the second section of the survey has been tailored to establish personal experiences of the respondents with common in-flight food delivery and waste collection services that are currently offered onboard of most commercial airlines. The feedback obtained in this section can help to identify some disadvantages or weaknesses of the current method. Last but not least, the conceptual idea of an automated food delivery and waste collection process is introduced in the third section of the survey questionnaire and the respondents are asked for their opinion on this idea. In addition, the respondents are also asked for their preferences and expectations with regards to the system performance features if such automated system is implemented onboard. Overall, a total of 539 responses from the public have been gathered from both survey sessions.

### Respondents' Demographic and Flying Experiences

As can be seen from Table 2, the gender of the survey respondents is skewed towards females with more than 60%. The majority of the survey respondents is within the targeted age group, which is 20 to 40 years old, which makes them among highly potential frequent travellers as referenced to a published study in Ref. [10].

Table 2: Demographic of survey participants

<b>Characteristics</b>	<b>Percentage (%)</b>	
<b>Gender</b>	Male	38.6
	Female	61.3
<b>Age Group (in years)</b>	< 20	7.8
	20 - 30	62.8
	31 - 40	19.5
	41 - 50	5.3
	51 - 60	2.8
	> 60	1.1
<b>Monthly Income (RM)</b>	≤ 1000	22.9
	1001 - 3000	27.4
	3001 - 5000	16.8
	> 5000	13.4

This is further supported by their responses on the number of flight trips that they typically make per year, where 81.3% of the respondents take flights

more than once per year with 36.7% of them at least travel once per month by commercial airlines. Therefore, it is taken that this pool of survey respondents is highly suitable to this study and their responses provide a good reflection of public's perception since they have plenty of flight experiences before participating in the survey.

Furthermore, when asked about their choice of typical domestic flight travel, 55.1% of the respondents picked to have in-flight meal services, even if they have to pay extra cost for the meals. In fact, an overwhelming 96.8% of the survey respondents have stated that they would prefer to use airlines with meal services compared to those without. All these indicate the vitality of the in-flight meal services to the passengers, hence this indirectly places a big emphasis on the process efficiency of food delivery and waste collection for better in-flight experiences.

The survey respondents are enquired with regards to their negative in-flight experiences involving the food delivery and waste collection process. Their responses are tabulated in Table 3 and it can be concluded that some of the anticipated process benefits or improvements achieved by implementing the proposed automated system are significant to improve the passengers' in-flight experience.

Table 3: In-flight experiences regarding the current meal services

<b>Scenarios</b>	<b>Percentage (%)</b>
You had to wait long for your meals, especially when the flight attendants started serving in other rows first.	41.4
The flight attendants could not serve your meals on-time, probably because of flight turbulence.	38.9
You were disturbed during your rest because other passengers in your row were being served (which you chose to skip to have your rest) or having their waste collected by the flight attendants.	36.9
The meal option that you wanted was no longer available because you were among the last passengers to be served.	36.7
You had to wait to use the lavatory because the service cart was blocking the aisle during the meal serving and waste collection process.	26.8

For instance, 41.4% of the respondents agreed that they had to wait long sometimes to be served with their meals. This is linked to their serving turn,

which depends on where their seats are assigned for the flight. Nevertheless, by having the automated system, this issue can be easily solved since the waiting time for the meal serving is reduced regardless of where the passengers are seated in the cabin. Based on Table 3, the perceived problems of the current manual food delivery and waste collection are also essentially verified by the survey respondents.

For more detailed insights on the passengers' perception of the current manual food delivery and waste collection service, the survey respondents are asked to rate the service based on several performance characteristics that are believed to be essential to the in-flight experiences. The resultant responses are tabulated in Table 4. Note that the rating exercise is done based on a scale between 1 to 5, where 1 is the lowest satisfaction level and 5 is the highest satisfaction level. As can be observed in Table 4, the obtained rating for all of the considered performance characteristics is just above average and below 4, which implies that they are still rather far from being at the highest level of passengers' satisfaction. This also indicates that there are indeed rooms for improvement that can be catered by automating the process. Referring back to the expected benefits of proposed automated process in Table 1, the rating for many of these characteristics can definitely be much improved.

Table 4: Performance rating of current food delivery and waste collection

<b>Performance Characteristics</b>	<b>Obtained Rating</b>
Service friendliness	3.58
Service time	3.43
Service flexibility	3.42
Passengers' convenience	3.40
Passengers' comfort	3.34
Passengers' privacy	3.20
Accident likelihood	3.22
Overall service efficiency	3.54

### **Respondents' Feedback on Proposed Automated Process**

Based on the responses, 63.7% of the survey respondents believed that the current food delivery and waste collection process can be further improved. A few of them, about 5.9% of the respondents, even believed that the current process is inefficient. Only 38% of the survey respondents prefer the process to be still done manually by the cabin crew while 56.3% of the respondents believed the effort to automate the process is good for its improvement. The remaining 5.3% of the respondents are feeling neutral regarding the effort and



do not particularly care on the mechanism the food is delivered to them and the waste collected from them afterwards. It should be noted that the automated process will work well for short haul flights because of the very limited available time for the meal serving during flight. For instance, on domestic flights with an hour duration, the cabin crew probably only have around 30 minutes to distribute the meals to all passengers and collect the waste afterwards before the aircraft starts descending for landing procedure. The available time to serve the passengers is further cut short if the aircraft experiences turbulence during its cruise as the meal serving cannot be done in such flight condition.

Between having a plenty meal options or having an efficient process, an overwhelming 77.3% responded that their priority will be on the more efficient process. This is taken to mean that, though with limited meal options to choose from, passengers will be happy if the automated process can serve them more efficiently than the current one. It is indeed anticipated that, since the automated system for the food delivery and waste collection will operate without cabin crew manually serving the meals, the types of meals that can be offered will be limited to maybe only light snacks and packed drinks. The survey respondents are asked regarding the type of meals that they think are suitable for short haul flights and the mass majority of them, about 94.3% of the total respondents, picked light meals and snacks. This feedback seems to be aligned well with the expected limitation of the meal types that could be served through the automated process mechanism.

In addition, the survey respondents are also enquired to determine the important design requirements for the new proposed automated in-flight food delivery and waste collection process. Their responses are shown in Table 5.

Table 5: Importance rating for design criteria of proposed automated process

<b>Design Criteria</b>	<b>Importance Rating</b>
Safe and low accidental risk	4.01
Able to deliver food and collect waste without discomforting other passengers	3.79
Able to collect waste at the passengers' own dictated time	3.47
Able to deliver food immediately upon the passengers' request	3.38
Able to request for meals at the passengers' own dictated time	3.15

Note that this rating exercise is based on a scale of 1 to 5, where a rating of 1 indicates the lowest level of importance to them and a rating of 5 is of the

highest importance level. This information is useful in formulating the design requirements that have to be satisfied during the development of the proposed mechanisms for the automated process.

Last but not least, the survey participants are also asked whether they are willing to be charged with extra fees for the automated in-flight service. This is to obtain some insights whether the costs of installing the automated process can be justified with a small increment of the flight charges to the passengers. Positively, more than 73% of respondents agree that increment of the flight charge is justifiable for the automated service, although 58.4% of them did mention that the acceptable increment should be minimal.

## **Conclusion**

A public survey has been conducted to the Malaysian public to establish the perception of the airlines' passengers on the current food delivery and waste collection process. From the responses, it can be concluded that there exist some rooms for improvement to raise the efficiency of the process for better in-flight experiences of passengers. An automated process of food delivery and waste collection has been proposed as a measure to improve the service. Based on feedbacks obtained from the survey respondents, this effort seems to be positively received by the majority. Moreover, the design requirements for the proposed automated process can also be established from the collected survey responses. Information obtained from this work can be used for future design development of an automated system onboard of existing commercial transport aircraft.

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