

11-2017

## A New Way to Improve Logistics Efficiency and Aircraft-Onground Recovery

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A NEW WAY TO IMPROVE LOGISTICS EFFICIENCY AND AIRCRAFT-ON-  
GROUND RECOVERY

by

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Gilson Macedo dos Santos

A Capstone Project Submitted to Embry-Riddle Aeronautical University in Partial  
Fulfillment of the Requirements for the Aviation Management Certificate Program

Embry-Riddle Aeronautical University

Sao Paulo, Brazil

November, 2017

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This Capstone Project was prepared and approved under the direction of the  
Group's Capstone Project Chair, Dr. Peter E. O'Reilly.

It was submitted to Embry-Riddle Aeronautical  
University in partial fulfillment of the requirements  
for the Aviation Management  
Certificate Program

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## Acknowledgements

First, we are grateful to be part of the first Embry Riddle Aviation Management class in Brazil. We also want to thank Fabio Campos for building this certificate program. He was very instrumental in creating such a wonderful environment for learning and to improve our aviation skills.

We would also like to thank ITL (Instituto de Transporte e Logistica) and the Brazilian Airlines that recruited us.

This project had a special meaning for the Group, because it was a huge challenge. We researched how we could change the logistics process for COMAT Material. A main issue, was to discover if the Airlines wanted to as well.

We would like to thank our families for being understanding for the time we spent away from them working on the Capstone Project. And the most precious attitude from them was when we were completely tired and all of the time they were saying, “You can do this.”, “stay strong”, “keep focused”.

We are grateful to the honorable Dr. Peter O’Reilly, our professor and mentor, for his supervision throughout the Capstone Project. As we say in Aviation, “He stayed with us 24x7 and kept us on track”.

We also would like to thank Mr. Filipe Reis from IATA. His air cargo experience was essential to our project. In addition, we appreciated the support provided to us by Dr. Beverly Wood. Her statistical knowledge was fantastic.

We are glad to finish this Capstone Project. We believe as a result of our research that there is an important opportunity for Airlines to improve their COMAT logistics.

“Live as if you were to die tomorrow. Learn as if you were to live forever.”  
— Mahatma Gandhi

## Abstract

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Title: A new way to improve logistics efficiency and aircraft-on-ground recovery

Institution: Embry-Riddle Aeronautical University

Year: 2017

This research project recommended an easier way of making COMAT logistics by enabling the airlines to use the empty spaces in cargo holds around the globe. Airlines using MyIDCargo would be able to book the available cargo with priority over regular cargo. In addition, this method would expedite the paperwork requirements from government agencies. Losing more than US\$ 5.2 million per year, in revenue or in profit margin, is no small deal for a small airline flying in South America. This is an estimate loss considering flight cancellations and delays over a period of 12 months related to COMAT logistics. These losses happen because this type of material has no priority over other types of cargo. Also, the cargo in question is considered as regular cargo by governmental authorities. When this happens, aircrafts are sitting on airport ramps idle all around the globe, waiting for the material that will restore normal operation. This is what the MyIDCargo project proposes.

*Key words:* COMAT, AOG, Airline network, recovery

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## **Chapter I**

### **Introduction**

The objective of this project was to bring more efficiency to logistics, improving time of Aircraft-on-Ground (AOG) recovery and developing possible saving for airlines operations. There proposed goal was to develop a system that would allow airlines to easily visualize an available space at the aircraft cargo bay on a desired flight and book its company materials (COMAT) on it, still respecting all appropriate regulation and the final availability of space.

This project was inspired by an existing system called MyIDTravel that allows jointed airline's personnel to buy available tickets with low fares. The objective was to develop something similar for COMAT. The personnel responsible for logistics at jointed airlines would be able to check available cargo bay spaces on the desired flights and book COMAT transportation paying regular prices but having priority over regular cargo. This would enhance the utilization of empty space and optimize the transportation of required material to restore or maintain the airlines operation.

### **Project Definition**

This project would be applicable to all airlines, since all of them do transport their aeronautical material to maintain their aircrafts. Airlines around the world sell space to transport cargo. However, when an airline cannot transport its own material due to over dimensions of major parts, airline network, technical problems with the transport aircraft, or there are no flights where the materials are needed, airlines need to contract a freight forwarder. The freight forwarder will find available cargo space in any other company, and arrange the transportation of the material.

Seconds are precious to airlines in AOG recovery operation, and after they find the required material to buy, the most difficult challenge is to arrange the logistics in a timely and

costly efficient manner. This would be when this project could benefit the airlines, providing means to check the available cargo bay space in scheduled flights, whether international or domestic. By making the task of moving AOG recovery needed parts around the globe faster than today, the project estimated that the commercial aviation industry can reduce its costs of irregular operations due to maintenance in approximately US\$ 900 million.

### **Project Goals and Scope**

The SWOT methodology was employed to identify if the proposal had the basic elements to achieve the success of this project. The project aimed to identify potential savings for those who buy cargo space and revenue for those who sell cargo space. In addition, this project served to propose ways to simplify the process of transporting materials.

To calculate the possible savings this project could generate, the authors considered two aspects:

- Logistics efficiency
- Competitive charge freight agreement.

This project did not consider Dangerous Goods (DG), catering or dry ice. Also, this project did not aim to deliver a finished system to handle the propose of the project.

### **Definition of Terms**

Cargo bay	The space in an aircraft for storing cargo.
Chargeable weight	The Actual Gross Weight or the Volumetric Weight of the shipment.
Explanatory method	Defined as an attempt to connect ideas to understand cause and effect, meaning researches want to explain what is going on.  Explanatory research looks at how things come together and interact.

Freight forwarding	Firm specializing in arranging storage and shipping of merchandise on behalf of its shippers. It usually provides a full range of services including: tracking inland transportation, preparation of shipping and export documents, warehousing, booking cargo space, negotiating freight charges, freight consolidation, cargo insurance, and filing of insurance claims.
Load factor	The percentage of available capacity that is actually sold and used by revenue passengers and/or freight, on a single flight over a single flight sector.
Major Parts	Cargo considered over dimension
MyIDTravel	Web platform that provides employees of associated airlines the opportunity of buying tickets at a better rate and consult the flight availability.
Revenue Management	Optimal price of selling a seat at any given point in time. The information required to be able to make this decision depends on a number of factors, not all of which have traditionally been available.
SWOT	Best practice framework for analyzing circumstances. This concept is an acronym for terms that represent important aspects to be analyzed when evaluating the environment where business will be conducted.

### **List of Acronyms**

AOG	Aircraft on ground
COMAT	Company materials
DG	Dangerous Goods

FAA	Federal Aviation Administration
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
KPI	Key Performance Indicator
MRO	Maintenance Repair and Overhaul
RM	Revenue Management
SLA	Service Level Agreement
SWOT	Strengths, Weakness, Opportunities and Threats

## Chapter II

### Review of Relevant Literature

#### General Overview of the Air Cargo Transportation Industry

Air transportation is a significant key to promote the development of nations, regions and continents around the world. Development can be accomplished by allowing trades, exchange of products and passengers travel in a timely and efficient manner. Air cargo is a trade facilitator that contributes to global economic development and creates millions of jobs. The global economy depends on the ability to deliver high-quality products at competitive prices to consumers worldwide (IATA, n.d). Through air transportation, people from all nations can go abroad for work, study or leisure. As this exchange of people happens, all kinds of goods become necessities and, therefore, require a fast and reliable transportation as well. It is impossible to disconnect the economic, technologic, and social development from the presence of a robust air transportation system that will enable the exchange of people, ideas and goods that will create the cultural and environmental transformation. Air transportation bears the most critical function in the modern logistics structure, especially when alternative transportation is relatively slow. (Chung et al., 2015).

In 2015, more than 52 million tons of cargo, with a value of more than US\$ 5.6 trillion, was transported by airplanes (IATA, 2016a). **The value represents approximately 35% of the global trade, even though it covers less than 1% by volume.** It is estimated that the global increase of air-cargo will be 5 per cent per year in the coming 20 years. (Chung et al., 2015).

Furthermore, the air cargo industry is important in enabling business and industries all over the world to deliver their products in a timely manner. In fact, time is of the essence when transporting perishable goods such as food, flowers and emergency items required at disaster's zones. Sometimes transporting by air is much safer when dealing with very

expensive goods (IATA, 2017b). Included in all this cargo transported by air, there are airplane parts needed to maintain planes flying safely and reliably.

It is estimated that the total direct disruption costs in domestic operations of the 10 major US airlines in 1998 was US\$1.83 billion, from which US\$858 million is attributed to flight cancellations and US\$909 million to flight delays (Bratu et al., 2006). Major airlines report irregular operations costs from US\$110 million to as high as US\$500 million per year. A general guideline is irregular operations costs equal approximately 4.0% of an airline's gross revenue and 10% of this value is related to maintenance (IATA, 2014). Aircraft and crew are also usually considered as major resources, and have to be recovered and returned to normal operations as soon as possible (Chung et al., 2015). The reduction of irregular operation costs is quite significant and directly affects airline's profitability (IATA, 2014).

### **How Air Cargo Transportation Works**

It is not a simple task to move goods from origin to destination when those two points can be in different States or continents. Items to be shipped could include personal belongings, very expensive, heavy and delicate pieces of equipment, live animals or perishable items. These items can turn the mission of receiving and delivering a cargo to its destination into a complex operation. There are the particularities of the cargo itself, as well as other issues, such as security and customs regulations. (IATA, 2016a).

It is important to note that most of all air cargo will be transported along with passengers in the same aircraft. This arise security issues for the passengers. It is important to guarantee the safety of the operation and the compliance with all local and international regulations. To do that, cargo is handled by several different entities, companies and persons with different responsibilities and objectives. Some of these stakeholders are aircraft operators, express carriers, postal operators, government agents, consignors, consignees, haulers and ground handlers (IATA, 2016a).

These air cargo agents work together to provide effective logistics management for client companies. Modern logistics management requires intensive information to be exchanged among agents. Information exchanges involving other industries, such as financial institutions, insurance brokers, and government agents, have also added to the diversity of handling information and knowledge. Air cargo logistics typically involve high value goods and the need to be time-definite. Information technology has been widely used in logistics management (Londe and Masters, 1994; Lewis and Talalayevsky, 1997; Euwe and Wortmann, 1998; Whipple et al., 2002 apud Chu, 2004). Figure 1 shows an overview of air cargo transportation.

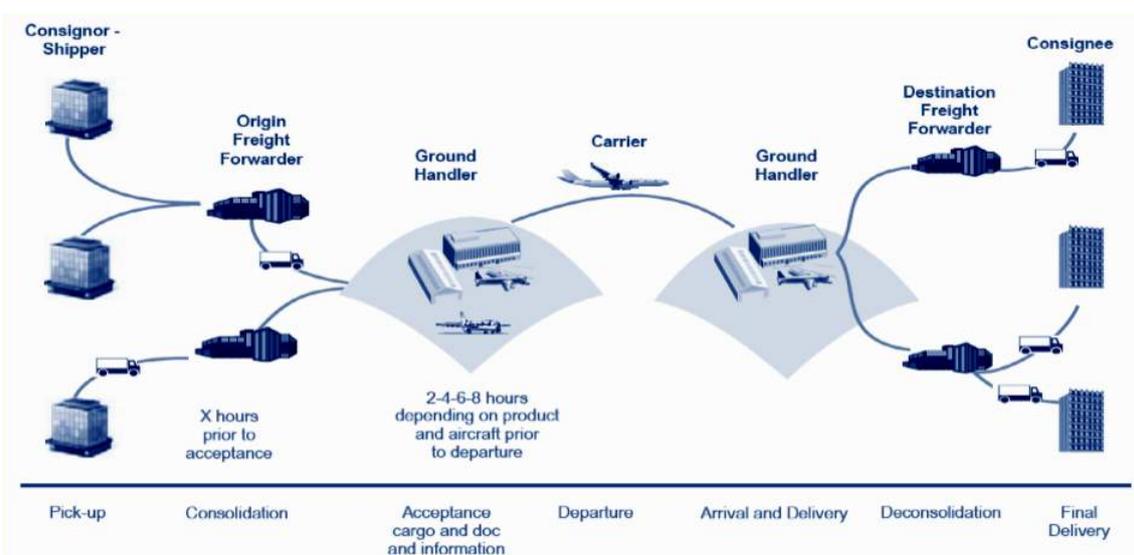


Figure 1. Air cargo movement overview. Source: ICAO, n.d.

Figure 1 shows the main steps air cargo goes through from the pick up at the consignor warehouse to the final delivery at the consignee address. While Figure 1 shows just the movements of the cargo, Figure 2 also shows some of the paperwork required to keep the movement going. The number and type of documents required to comply with all safety, security and governmental requirements vary widely depending on the points of origin and destination (ICAO, n.d.).

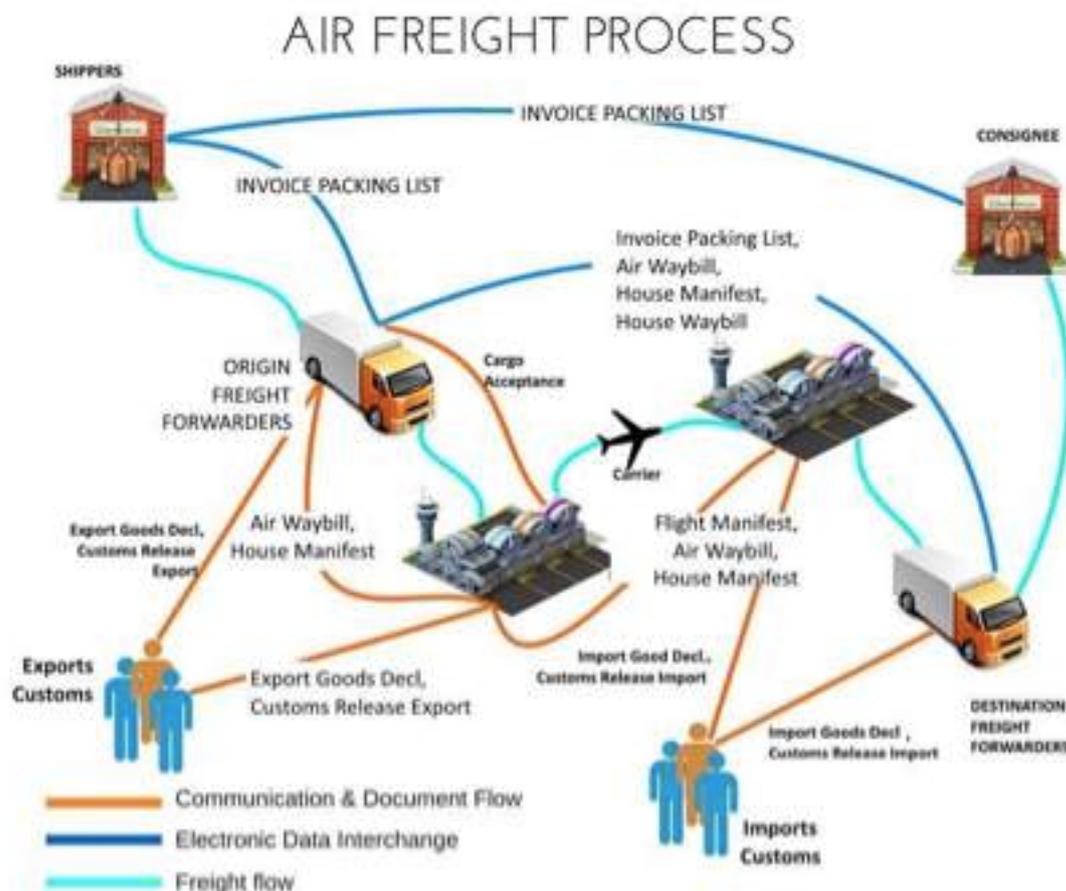


Figure 2. The process of air freight. Source: Transco International, 2016.

It is easy to perceive, by comparing the blue line, or freight flow, with the brown line, or communication and document flow, that there is a lot of paperwork to be done between each movement of the cargo itself. It is also clear the presence of the government agents at customs, who will require all documents and authorizations related to the type of the cargo to be completed.

### **Air Cargo Transportation Problems**

The biggest problem facing air cargo transportation is the process is still paper based. These documents make it difficult and slow to get cargo dispatched, tracked and received. As pointed out in the 11<sup>o</sup> World Cargo Symposium, the customers are requiring a more efficient system. According to an article by Patrick Burnson at Supply Chain 247

Magazine (2017), Alexandre de Juniac, IATA's Director General and CEO, said "Listening to the customer has never been more important. The positive forces currently supporting growth are good news. However, our customers are telling us that they expect more. Complicated and convoluted paper-based processes that are basically unchanged from the 16th century are still being used in air cargo today. Our customers pay a premium to ship by air. They expect modern processes and high quality services".

The same article cited above also informed that the industry was struggling to promote a digital revolution, introducing an e-freight system. For the past decade, e-freight has only reached 50% of penetration. In other words, only 50% of the air cargo industry is using the e-freight platform (IATA, 2017c). This is clearly a point of contention for the industry.

Another aspect that challenges the cargo transportation industry is the widely range of documents and requirements that need to be satisfied depending on the origin, destination and type of products. With unified and simplified laws and regulations around the world, the positive impact on cargo transportation and distribution of digital information would be huge. (ICAO, n.d.)

The Federal Aviation Administration (FAA) determines that only an airline with an FAA approved Hazardous Material/ Dangerous Goods program may transport its own materials as COMAT. If an airline does not have an approved program, it must put its COMAT in another carrier for transport as normal cargo. An internal problem is that by traveling without generating any revenue, the airline cargo tends to treat COMAT as a low priority cargo, said William R. Boesch, Vice President, Cargo, American Airlines (Breskin, 1990).

## **Chapter III**

### **Methodology**

The methodology used in this project considered the actual air cargo scenario to explain how COMAT cargo works, consequently identifying the opportunity to improve the logistic efficiency and minimizing AOG recovery time for the airlines.

The project scope considered three phases: planning, controlling, and closing. In planning, the authors had a conference call once a week with the Capstone Chair and a meeting by phone between the authors, also once a week. External support was received by IATA consultants, professors from Embry-Riddle and freight forwarders companies.

The controlling and monitoring phase focused on deliverables, schedule, focus, and disapproving/approving project changes. The closing phase involved the authors auditing the project deliverables and conducting an assessment of the outcomes.

The study focused on developing a new process to improve logistics for COMAT cargo, using available space in any airplane cargo bay that was available. To support the gains that come from this project, the authors used a SWOT analysis methodology to organize the strengths, weaknesses, threats and opportunities that came from this project.

### **Experimental Design**

There were certain limitations in undertaking this research work. COMAT Cargo is a specific process that just airlines have. Consequently, the project team could not find enough literature to proof some concepts that was considered for this study. Despite the limitations inherent to the project, the authors understand that the benefits of the project surpassed these barriers, thus turning the results significantly beneficial to the whole industry.

To illustrate the benefits of this project, the authors used a real case from “X” Airlines. Recently, “X” Airlines had a B-737-800 aircraft landing at the Montevideo airport, where a bird strike occurred on final approach. The aircraft proceeded normally to land. After

inspections on the aircraft by maintenance personnel, it was found that the bird strike occurred on the right engine and had damaged three fan blades. The three blades were replaced and in order to perform all tests required by the aircraft maintenance manual, all blades had to be lubricated with a specific grease.

At that station, the company did not have the necessary material (grease) to carry out the work. Therefore, the aircraft remained in the AOG condition for 53 hours. Of that total, 30 hours were spent waiting for the grease to arrive on the next flight of the airline. On that day, there were three more flights from other airlines, but due to the difficulty of sending the material, the company could not ship the material in time. The material was sent on the next flight of the same airline, two days later.

Exactly to the point of this project, MyIDCargo could have worked helping any affected airline to find the best flight within its own flight network or in another airline with available space on airplanes' cargo bay. Such actions would have reduced the time of recovery from this AOG situation.

In this example, calculating the savings regarding time, if "X" Airlines shipped the material on the next flight of any airline that had available space on their cargo bay, it could have saved forty-four hours. Using Boeing's standard cost factor, this time in value would be US\$ 312,400.

Similar to "X" Airlines, other airlines faces problems like these every day. The main focus of any airline must be recovery from an AOG situation as soon as possible, while following all established procedures of safety.

It is important to note that the research conducted did not identify any carrier or group of carriers that utilized other carriers' available cargo space.

## Survey

For this study, the authors conducted a survey using airlines logistic department and Freight Forwarding companies. The authors shared the objectives and the purposes of the study in the survey.

The survey was forwarded to people in charge of the logistic departments along with an overview of the project. The objective was to give some knowledge about what was the intent of the MyIDCargo project. This allowed the researchers to probe opinions regarding the usefulness of the project. In other words, interviewees were indirectly surveyed to the relevance of the projects as well.

## SWOT Analysis

The SWOT analysis is widely used in new projects, since it consists of making a complete diagnosis about the subject of the project and the environment that surrounds it. With this, the authors had a foundation to formulate the strategies with more security. The result of the analysis is the creation of a matrix, also called the SWOT Matrix, which helped to identify the main internal factors to be worked and the external points that demand attention.

The researchers identified that it was possible to prove the advantages from MyIDCargo for the airlines. According to the IATA (2017g) website, there is approximately 30% available space in the airplane's cargo bay that the airlines do not sell.

Table 1

### *Weight load factor*

Year	2015	2016	2017
Weigh load factor, % ATK	66,9	66,9	67,8

Note. ATK: Available tonne kilometers.

The analysis of the internal environment determined the strengths and weaknesses of this project. The analysis of the external environment allowed the definition of opportunities and threats. Figure 3 displays both the internal factors, such as Strengths and Weaknesses, which can be controlled by a firm, and the external factors, such as Opportunities and Threats, which firms have little control over.

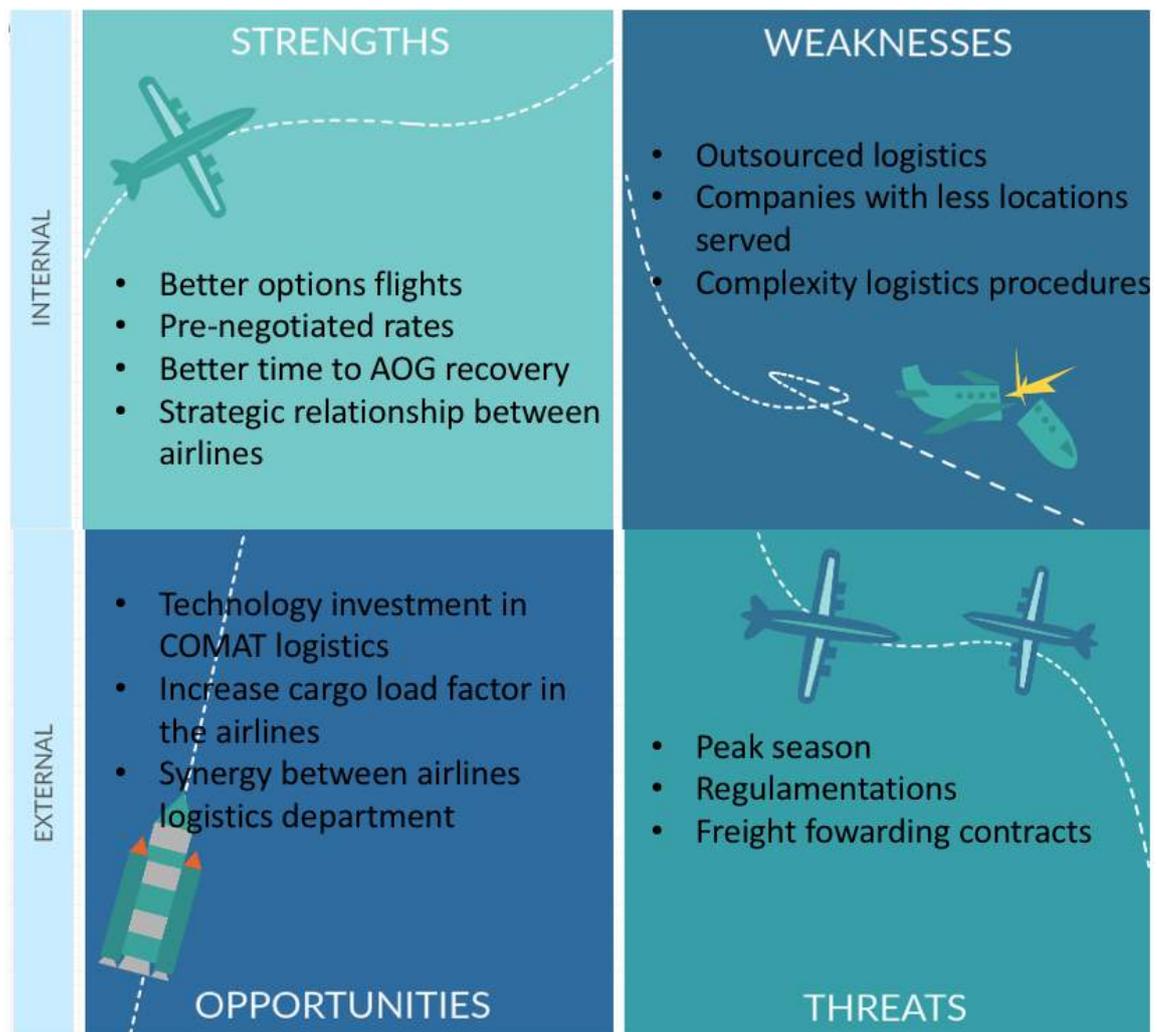


Figure 3. MyIDCargo Project SWOT matrix.

#### Data Source (s), Collection and Analysis

This research study was categorized as an explanatory method. The main source of information for this study was based on the data collection from Survey. Secondary data was

also collected, since the authors used experiences from employees of Logistics and Maintenance departments.

As secondary data, the group also collected information from the official website of IATA and from other official websites related to general air cargo transportation. IATA (2017d) released data for global air freight markets showing that demand, measured in freight ton kilometers (FTKs), grew by 3.8% in 2016 compared to 2015. This was nearly double of the industry's average growth rate of 2.0% over the last five years. Freight capacity, measured in available freight ton kilometers (AFTKs), increased by 5.3% in 2016.

All regions, except Latin America, experienced positive freight growth in 2016. Carriers in Europe accounted for almost half of the total annual increase in demand.

After a weak start in 2016, global freight volumes recovered in the second half of the year. A strong peak season, an increase in the shipment of silicon materials and a turnaround in new export orders contributed to the later uptick in demand. The early timing of the Lunar New Year (in January 2017) may also have helped to push demand higher in December.

“The air cargo industry must also improve its competitiveness. We know the way forward is defined by digital processes which will drive efficiency and improve customer satisfaction. We must use the momentum of renewed demand growth to drive the important innovations of the e-cargo vision,” said Alexandre de Juniac, IATA's Director General and CEO (IATA, 2017d).

## Chapter IV

### Project Outcomes

A major element in the MyIDCargo Project was the survey sent to the main Brazilian Airlines, such as Avianca, Azul, GOL and LATAM. The survey was also submitted to two Freight Forwarding companies.

#### Survey Questions

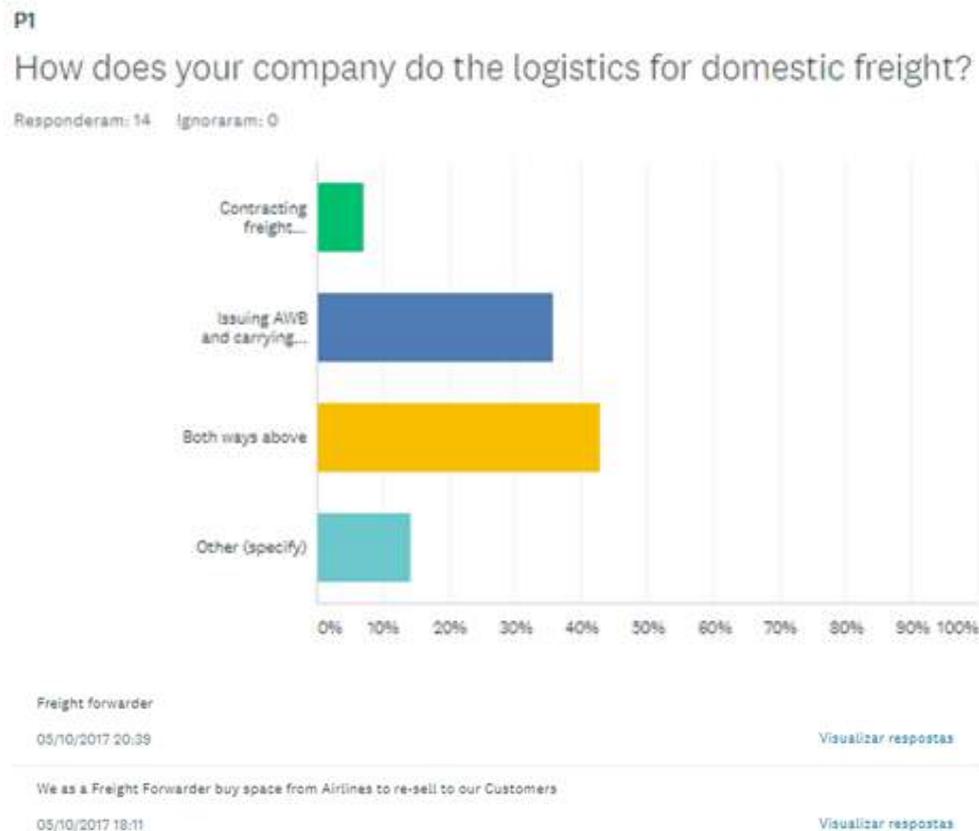
The purpose of the survey was to identify how the Brazilian airlines manage COMAT materials, validate the MyIDCargo project and understand if the concept could be beneficial for airlines' daily operations.

The survey was divided in six questions. Five of the questions were multiple choices (the interviewee chose the option that best fits their company), one question was open to typing which airline the interviewee worked for.

Below are all the questions and the results from this survey. Each question's result was illustrated in a bar graph. The graph presented categorical data. In this way, the results were proportional to the values that they represented.

**Question 1. How does your company do the logistics for domestic freight?** In this question, it is possible to see how some companies were doing their domestic logistics. It was clear that almost all of them were using their own cargo bay or contracting a third parties companies, which made the prices higher, as shown in Figure 4.

**Question 2. How does your company do the logistics for international freight?** It is understandable why airlines answered "both ways" in this question, as some suppliers are from Asia, Europe, and Middle East. Consequently, in these cases it was almost impossible for Brazilian airlines to make their own logistics without a support from specialists. This was not airlines' deficiencies. It was due to an operational limitation because not all Brazilian



*Figure 4.* Domestic Logistics. Source: SurveyMonkey.

airlines have network flight to Asia or Middle East. See Figure 5.

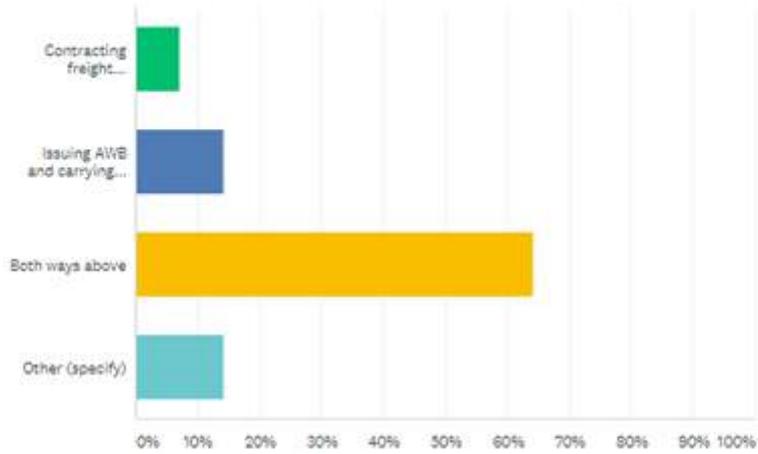
Usually airlines have to contract an international freight forwarding company to find the best flights for them in particular regions.

**Question 3. How does your company do the logistics for COMAT?** The purpose of the third question was to demonstrate that currently all Brazilian airlines have an opportunity of building synergy between them in regards to using available cargo space. It was demonstrated that the airlines were contracting third-party companies or using own cargo bays to transport COMAT cargo, as shown in Figure 6.

P2

### How does your company do the logistics for international freight?

Responderam: 14 Ignoraram: 0



Freight forwarder

05/10/2017 20:39

[Visualizar respostas](#)

We as a Freight Forwarder buy space from Airlines to re-sell to our Customers

05/10/2017 18:11

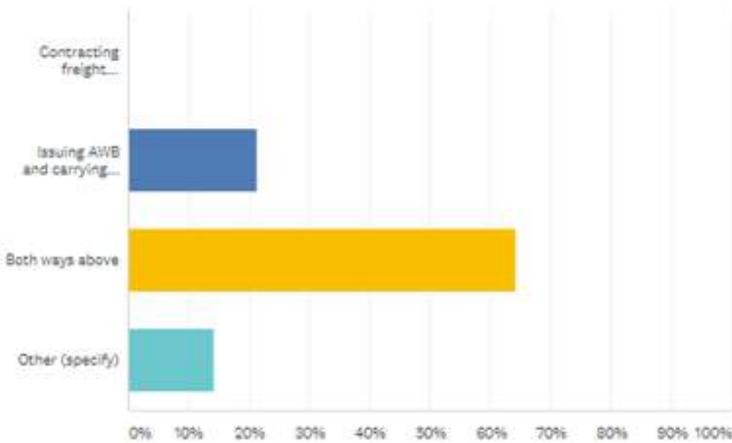
[Visualizar respostas](#)

Figure 5. International Logistics. Source: SurveyMonkey.

P3

### How does your company do the logistics for COMAT?

Responderam: 14 Ignoraram: 0



Freight forwarder

05/10/2017 20:39

[Visualizar respostas](#)

We as a Freight Forwarder buy space from Airlines to re-sell to our Customers

05/10/2017 18:11

[Visualizar respostas](#)

Figure 6. COMAT Logistics. Source: SurveyMonkey.

**Question 4. Based on what you have heard about MyIDCargo, would you recommend it to be implemented by your company?** The only entity that did not recommend the use of MyIDCargo was the freight forwarding companies. These companies felt that the MyIDCargo would not help their businesses.

It was notable to see how the airlines have been struggling on a daily basis in regards to COMAT transportation. As a result, it is difficult to improve their AOG recovery times. The airlines were looking for new ideas to change their logistics operations. MyIDCargo would help to remedy that problem, while at the same time increasing their revenue stream. See Figure 7.

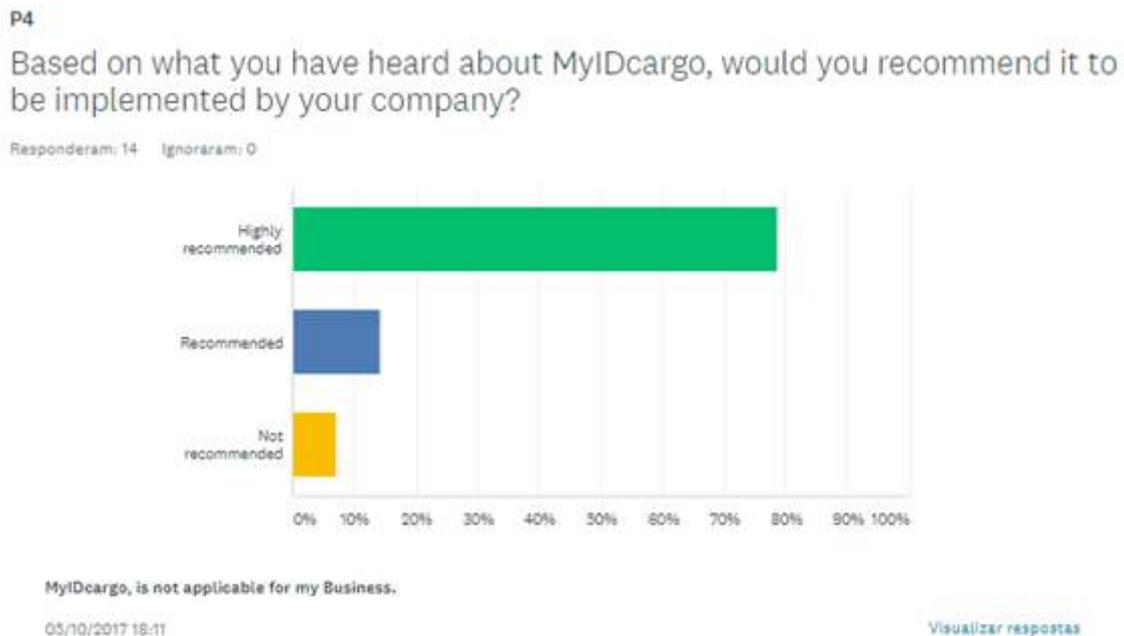


Figure 7. Recommendations. Source: SurveyMonkey

**Question 5. Does your company have a safety stock?** Safety stock was a calibrated surplus of aircraft parts kept as part of airlines' inventory in order to support the lack parts in a timely manner. The safety stock may be needed to support the operations in all stations. This information showed that the main problem of the airlines was not related to buying the aircraft items, but how hard it was to transport them faster from Point A to Point B, as shown in Figure 8.



Figure 8. Safety Stock. Source: SurveyMonkey.

**Question 6. Which airline do you work for?** This question was elaborated to record who has answered the survey because an anonymous reply was not accepted, due to the initial proposal of this survey being to understand how the airlines work in regards to shipping of cargos.

Although there were several challenges to face before implementing this project, there was an advantage to considering a new way to handle COMAT cargo. With this survey, it was possible to understand how the Airlines do their cargo logistics. The survey also helped to identify possible advantages like more efficiency logistics providing for a better recovery time. Other benefits ascertained were avoiding too much time that aircrafts stay on the ground. This could result in the possibility of saving money by not using a freight forwarding company.

P6

Which airline do you work for?

LATAM AIRLINES	11/10/2017 11:17	Visualizar respostas
Avianca Brasil	10/10/2017 10:46	Visualizar respostas
GOL Linhas Aereas	09/10/2017 22:23	Visualizar respostas
Go! Airlines	08/10/2017 17:44	Visualizar respostas
Asia Shipping Freight forwarding	05/10/2017 20:39	Visualizar respostas
DHS Logistics (not an Airline)	05/10/2017 18:11	Visualizar respostas
LATAM Airlines	04/10/2017 13:06	Visualizar respostas
LATAM	04/10/2017 10:50	Visualizar respostas
LATAM Airlines Group	04/10/2017 09:06	Visualizar respostas
azul linhas aereas	04/10/2017 09:04	Visualizar respostas
LATAM	04/10/2017 09:02	Visualizar respostas
LATAM AIRLINES	04/10/2017 08:52	Visualizar respostas

Figure 9. Participating Airlines vs. Freight Forwarders. Source: SurveyMonkey.

### Key Performance Indicator

Key Performance Indicator (KPI) is a measurable value that demonstrates how effectively a company is achieving key business objectives. KPI's provide airlines and airports with important metrics to improve their aviation daily operations.

The MyIDCargo project brought some important KPI's examples related to the daily operations measuring AOGs recovery and the negotiated allotments. Due to a confidential

issue, the project could not use the name of the airline that participated in this research project. Each airline is different. Each airline will have different lists of key performance indicators.

To exemplify part of the research, a participating airline was named “ABC Airlines”. In the research with ABC Airlines, the authors measured the indicators by aircraft type, for example, analyzing narrow-body type in a separated indicator than the wide-body airliners. This was important as airlines have different aircraft models in their fleet.

ABC Airlines also separated the responsibility of Maintenance and Supply Chain department. The maintenance responsibility is to indicate for Supply Chain what is needed in regards to parts shortage and the deadline to deliver the parts. On the other hand, Supply Chain responsibility is to purchase COMAT and delivery them to the maintenance team as fast as possible, no matter if it is a national or international purchase.

**Total AOG Daily Hours for Narrow Body Aircraft.** Figure 10 shows total AOG for narrow-body aircraft, this KPI is monitored daily to track the performance of maintenance and supply chain departments.

MyIDCargo can improve the orange line by reducing hours in logistics operations.

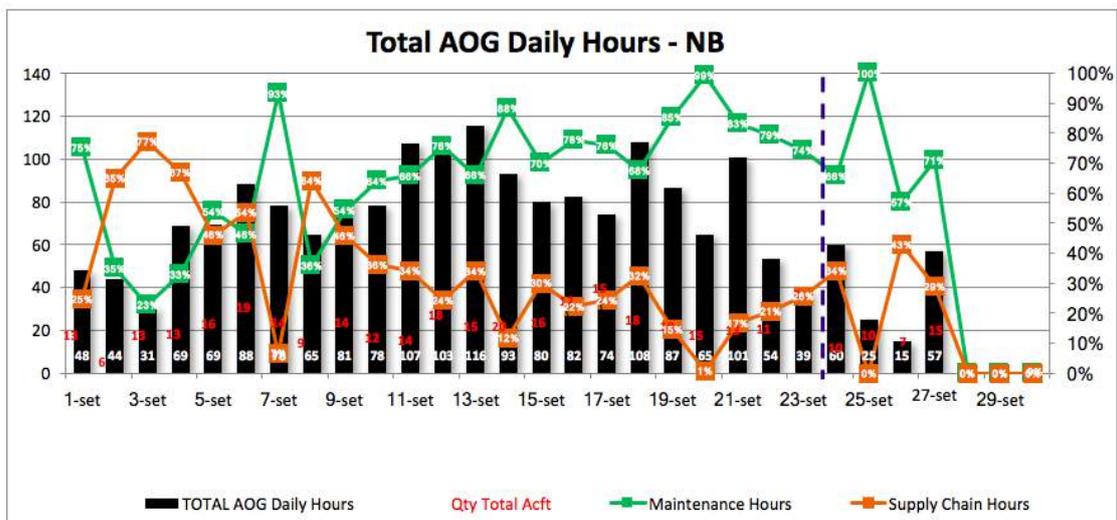


Figure 10. Key Performance Indicator - ABC Airlines - Total AOG Daily Hours Narrow Body aircraft

**Total AOG Daily Hours for Wide Body Aircraft.** Figure 11 bar displayed the total AOG for wide-body aircraft, this KPI is monitored daily to track the performance of maintenance and supply chain departments.

Similar to Figure 10, Figure 11 shows that the MyIDCargo project could improve the orange line by reducing the hours in logistics operations.

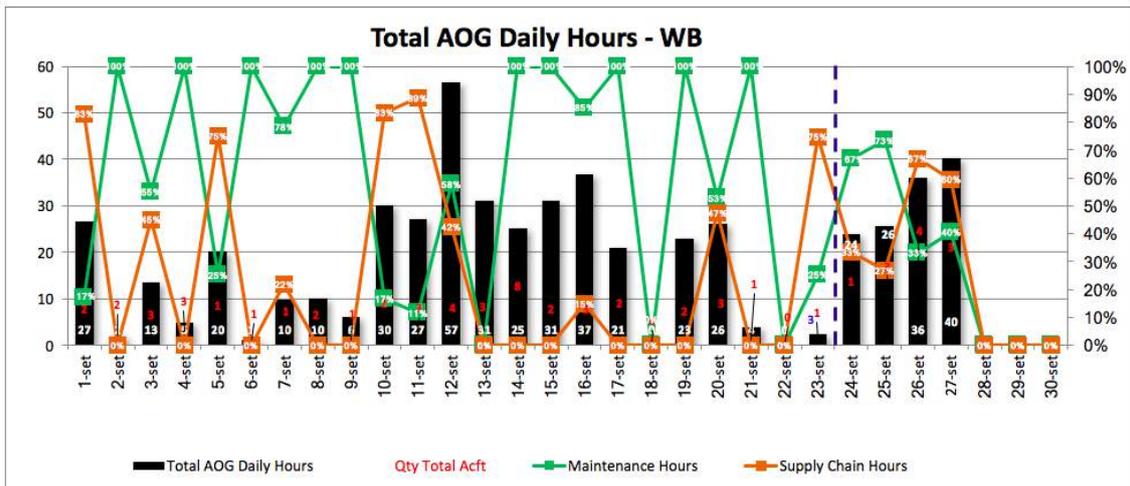


Figure 11. Key Performance Indicator - ABC Airlines - Total AOG Daily Hours - Wide Body aircraft

**Total AOG Daily Hours for Narrow Body and Wide Body Aircraft.** Figure 12

combined both narrow and wide body aircraft.

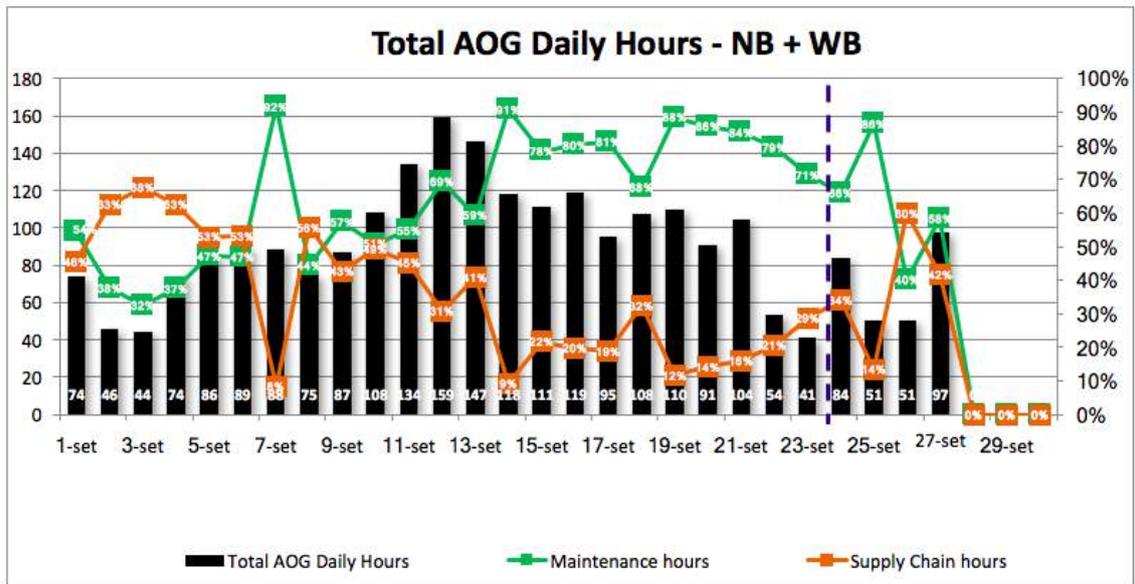


Figure 12. Key Performance Indicator - ABC Airlines - Total AOG Daily Hours - Narrow Body and Wide Body aircraft

**Average AOG Monthly Hours last 12 Months.** Figure 13 demonstrates the average

results from the last 12 months. In this KPI, and in the following one, it was possible to gather data, analyze them, identify root causes and create the most adequate action plan.

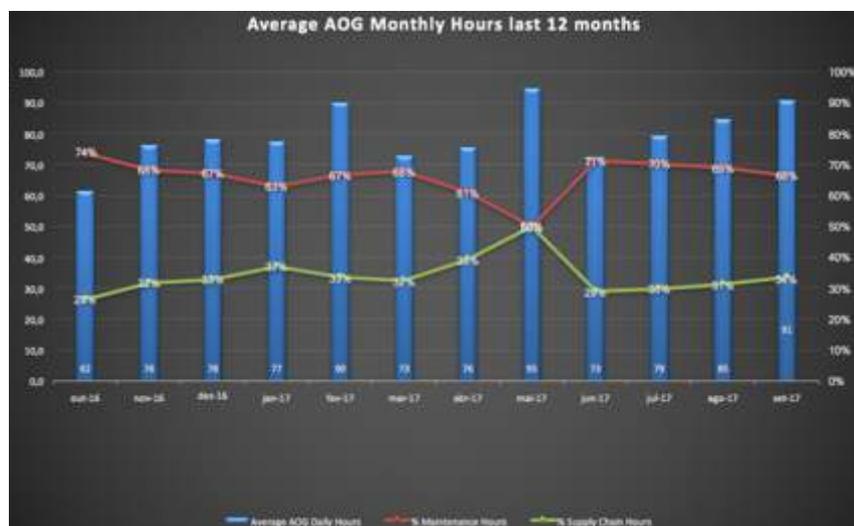


Figure 13. Key Performance Indicator - ABC Airlines - Average AOG Monthly Hours last 12 months

**Key Performance Indicator to Negotiate Allotments.** Revenue Management (RM)

in air cargo consists of short and mid-term allocation processes. The short-term allocation process allocates available flight capacity to volatile spot market demand. Shippers are charged based on the floating market rate.

Similarly, to the allocation process for passenger RM, the allocation process was run nightly to update the capacity allocation given the remaining capacity and updated demand forecast. Working with MyIDCargo the allotments indicator demonstrated to be a good method to control the cargo bay space available. It will be possible to manage the cargo bay space resulting allocation policy for COMAT cargo.

This way, allocating flight capacity to large and regular shipments can provide a stable revenue stream to the carrier. By providing binding regular shipments, shippers in return received a discounted rate and guaranteed space.

Figure 14 shows important information, such as origin, regions, gross weight, priority cargo and month to filter the information. These are key information to manage allotments.

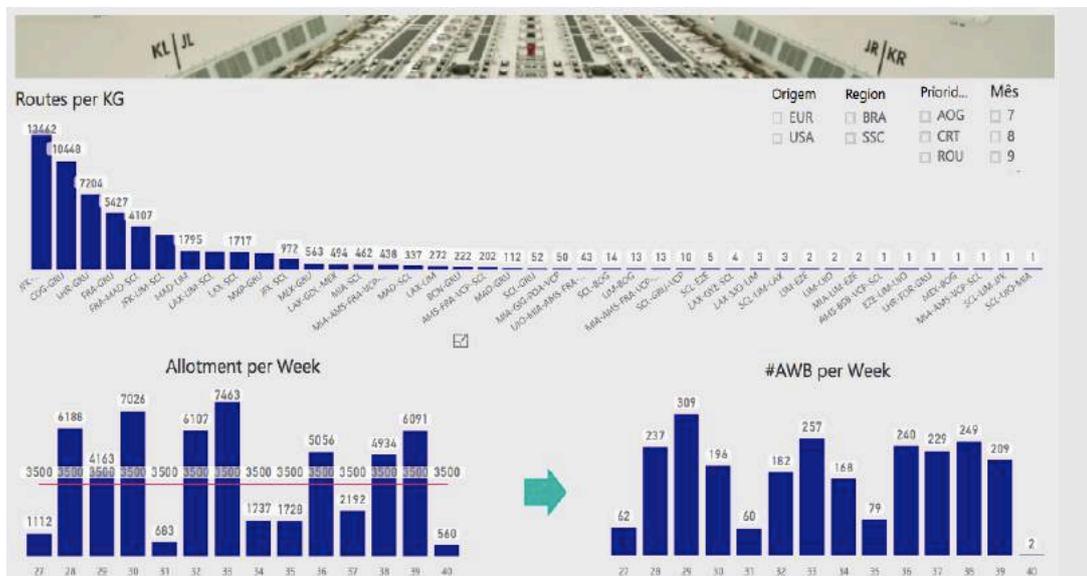


Figure 14. Key Performance Indicator - ABC Airlines - Negotiate Allotments

**Key Performance Indicator Aging to Shipment by Priority.** To guarantee the success of MyIDCargo, it is mandatory to follow the airlines shipping time of COMAT materials. For each airline that joins to MyIDCargo, it is important to sign a Service Level Agreement (SLA) to carry COMAT cargo, because without a good timing performance from airlines logistics MyIDCargo cannot provide a better recovery time. The Logistics department can manage a KPI for each Airline that joined the MyIDCargo visibility system, as shown in Figure 15.

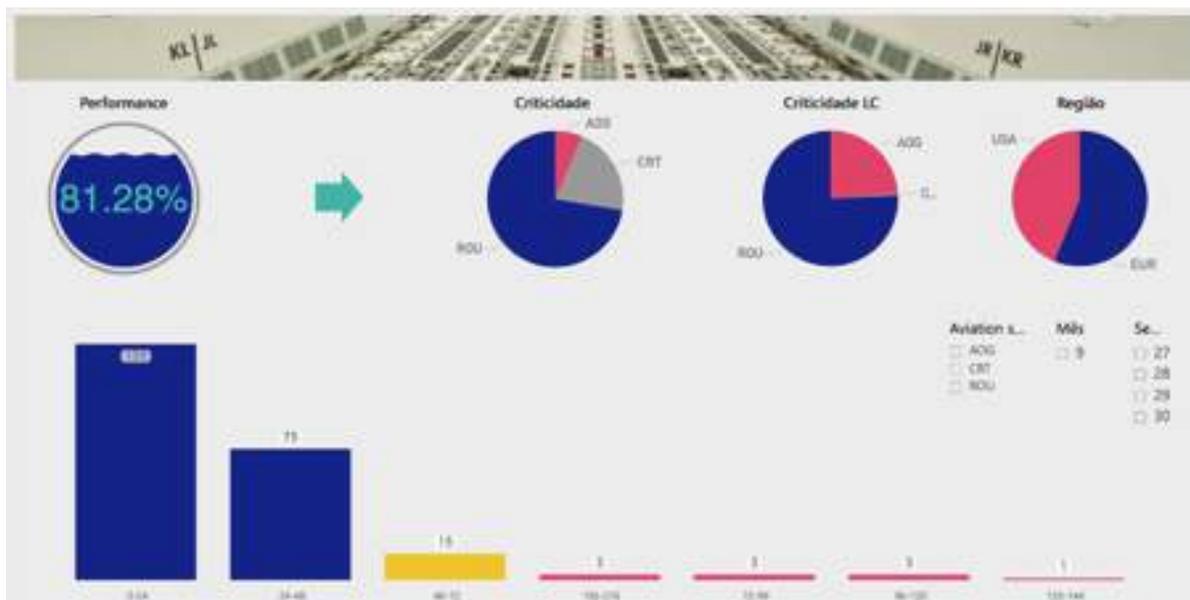


Figure 15. Key Performance Indicator - ABC Airlines - Aging to Shipment by Priority

In summary, the outcomes from the survey showed that MyIDCargo Project has a positive challenge to provide an innovative way of performing COMAT logistics. The survey showed that Brazilian airlines are inclined to adhering to this project.

## Chapter V

### Project Conclusions

#### Conclusions

The authors were supported by Air Cargo experts in several situations, during the project timeframe and developing new network with different airlines to try to understand how COMAT was handled. The project's initial goal was to propose savings in freight costs for any airlines that has to transport COMAT. However, during the research process, the project goal changed because it was identified that the costs of the aircraft down time are much higher than the costs with the COMAT logistics even when key parts are involved.

All projects have weak points and this project is no different. One of the problems could be the various high season for the airlines. During these periods the load factor tend to be higher, making it difficult to find space even when paying the highest freight fare. Another problem could be the lack of situational awareness that can make a very important COMAT to be left behind in order to give space for a far less critical cargo.

Analyzing the data described in Figures 10, 11 and 12, representing one month of operation of a mixed fleet of wide and narrow bodies, the authors could obtain the following information: airline ABC faced 422 AOG events in 30 days, leading to a total of 2455 hours of aircraft out of service, from which 34% (835.6 hours) was the time waited to secure the COMAT available to solve the problem.

Reviewing the data described in Figure 13, obtained from one of the airlines operating in Brazil, regarding monthly average AOG recovery time, it is clear that the logistics can make a significant difference in this matter. The company had a total of 953.3 hours of aircraft out of service, of which 34% (326.4 hours) was the time waited to secure the COMAT available to solve the problem.

It is interesting to note that even for two very different fleets, the mean time out of service due to material logistics was around 34% of the total AOG time. Considering that for a narrow body aircraft a flight cancellation can cost as much as US\$ 28,500 and one hour out of operation can cost as much as US\$ 7,100, and that this project can assist airlines to cut approximately 30% of the logistics time, it became evident the importance and scope of the MyIDcargo project.

One of the Brazilian airlines which operation is represented in Figure 13, faced 642 AOG events involving COMAT with its narrow body fleet that led to flight cancellations or delays, over the past 12 months. Using only the estimate costs for one hour of aircraft out of service, the 953.3 hours actually out of service costs above US\$6.76million.

The survey showed that while most airlines may like the advantages offered by MyIDCargo, some freight forwarders do not. To ensure freight forwarders would adhere to the project, it is important to assure them that the MyIDCargo will only be used for COMAT. This in turn will make more airplanes available to transport passengers and the cargo that airlines and freight forwarders need to keep their business profitable.

The researchers understand that even with few airlines used in the analysis, the information collected is enough to prove the point that the project MyIDCargo is worth of consideration. The data gathered with Brazilian airlines was extrapolate to have a larger scale projection.

The project consists of two major points of interest. One is how to visualize and book available or empty cargo hold space for COMAT in other companies in order to expedite its transportation. The other has to do with current countries customs regulation.

The project proposes that airlines should be able to ask directly for a cargo hold space on a specific flight for COMAT as airlines can do for a seat on the same flights. The

operating company would still be able to refuse such request but as part of the My ID Cargo agreement, the request would at least be considered with the highest priority

As for the regulation issue, aircraft material and component's specifications are well known by the aeronautical authorities worldwide, therefore there is a strong argument to support the idea of having a special regulation regarding its transportation, and even more especially if the material is intended to be used in AOG recovery. On this specific matter, it is important to count on entities that represent the airlines, such as Abear, in Brazil, and IATA, worldwide, to take this issue on and stimulate a discussion that would eventually turn into a change in the regulation of COMAT.

### **Recommendations**

Since the real issue is the aircraft time out of service waiting for material, along with the potential to flight cancellations, the authors recommend a new approach for COMAT transportation, considering the points below:

- Create a priority process to ship COMAT material, saving the aviation industry an estimated US\$ 900 Million.
- Develop the MyIDCargo system
- Develop the MyIDCargo app
- Develop a system to manage the visibility for available space cargo
- Request special legislation for COMAT material.

The goal is to give a higher priority for COMAT, which is not done nowadays. The authors recommend that all COMAT should have priority over other cargo, except over those destined for humanitarian aid or perishable goods. The authors estimate a potential of US\$ 900 million (0.12% of aviation industry annual revenue) in savings for the aviation industry as a whole. This would be the first and more immediate benefit of the MyIDCargo project. This would ensure that COMAT will not be left behind in order to make profit on one

shipment, while losing thousands of dollars with an aircraft out of service and canceled flights. Another benefit would be a creation of a new cargo-booking platform. This new platform will give the airlines visibility of the available space for COMAT, expediting the decisions regarding the movement of the material.

Besides that, it would be advisable and helpful, though difficult to accomplish as well, to have the governments understanding the situation and creating a special channel for COMAT export and import. The channel must be one that allows for an expedite process through customs in order to have the aircrafts flying in a timely manner.

### **Future Research**

One complication that this project faced was the lack of data from available cargo bay space. In the aviation industry, airlines avoid to share any data, other than what it is required by regulation. In general, there are some researches and literatures about air cargo, however nothing specifically about COMAT cargo. Therefore, the authors were not able to determine how much COMAT is being transported. However, it is known, according to the IATA website, that roughly 30% of the cargo holds are regularly empty and, therefore, it would not be a problem to accommodate all COMAT moving back and forth. Another important information that is not available is how many events of aircraft in AOG situation due to COMAT logistics occurs daily or monthly. A small sample from Brazilian airlines showed that approximately 30% of the aircraft out of service time is waiting for logistic. Based on that, the authors feel that further research on these topics are necessary to appropriately address all the subjects that might be lying beneath.

It was possible to learn about the similar ideas that the IATA website showed about E-AWB, hence not only for COMAT but for any kind of cargo.

Implementing this project would required specific knowledge and software proficiency. Access to training or subject matter experts should be considered in such cases.

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