Finalization of a lean manufacturing process within the customer support service of Latécoère
Master thesis report
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Abstract

This master thesis proposes the implementation of a Lean Manufacturing process within the customer support service of Latécoère. The origin of the need comes from a demand of our most important customer: Airbus, to set up a Lean process based on Value Stream mapping (VSM). When I arrived in January in Latécoère, the process was already started.

I first studied all the Lean Manufacturing theory thanks to the lessons I got in KTH, and also thanks to the Lean expert of Latécoère. All this study is described in the part “Theory” of this report.

Then we put into practice this theory in the service in order to improve its performance. Finally thanks to some KPI set up, it was possible to measure the improvements of the process and to explain them.
Before everything I would like to thank Emmanuel DUNOUVION without whom I wouldn't have had the chance to perform my master thesis in Latécoère. I would like to thank all the customer support service for their kindness and their help.

I would like to thank all my colleagues from Latécoère, and especially Benjamin Grosjean, Julien Laffont and François Laurens, for having made my job in Latécoère pleasant, by always having a nice atmosphere.

Finally I want to deeply thank Jean Noël Robert, my supervisor in Latécoère for all the time he spent helping me!
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1) Introduction

The aim of the project is to finalize a Lean Manufacturing process started on July 2012, based on Value Stream Mapping. The process concerns the whole customer return flow of a product arriving at the repair station of Latécoère. This process includes the services: reception, customs clearance, client support, equipment system management, invoicing, sells administration and expeditions.

Task definition:

- Cary on and deepen the VSM work in order to shorten the repairing period (SPT: Shop Processing Time) with the customer contractual period as aim.
- Within the DMAIC process, the Define and Measure parts have been completed. Now the work is to finalize the Analyze, Innovate and Control tasks.
- Work to set up an organization that enables to shorten the repairing period.
- Create relevant indicators of measures to the strategic steps of this flow.
- Optimize this flow in order that the approach of all the actors fits into a real continuous improvement process.
- The deployment of this organization must enable the company to get back the customer satisfaction

In this report, some figures have voluntary been deleted, it is due to the privacy policy of the company. It is the same for some graphics that I wasn’t allowed to translate into English.

As I have been hired in the company, I will keep on working in this VSM project in order to set up all the action plans planned.
2) Method

The aim of this thesis was to put into practice the theory I gave learned at school and to adapt all the knowledge into something that could actually set up in a company. What I first did was to analyze thanks to all the lean manufacturing tools, what could be implemented in the company, and then to set up this manufacturing process in the company.

3) Company presentation

Latecoère has been founded in 1917 by Pierre-Georges Latecoère (Figure 1 - Pierre-Georges Latecoère). It was the first company to create an aircraft assembly factory in Toulouse in the south of France which is nowadays one of the most important aeronautic area in the world, mainly thanks to Airbus.

Figure 1 - Pierre-Georges Latecoère

Latecoère also got its own airline company that boasted lots of famous pilots such as Antoine de Saint Exupéry, Jean Mermoz and Henry Guillaumet. Latecoère Airlines set 31 world records that established new standards of industrial achievement in France. In 1950, Latecoère stopped producing its own aircrafts to be one of the main suppliers of many leading aircraft manufacturer such as Airbus, Dassault, Embraer and Boeing.

Latecoère’s presence in all sectors of the industry is due to a growth strategy based on partnerships in the fields of aero structures and on-board wirings & systems. Latecoère can now draw on the resources of an international network of subsidiaries, partnerships and sub—contractors.

This competitive, flexible industrial base enables Latecoère to deal effectively with cyclical shifts in the worldwide aviation market and offers customers the global solutions they need.
4) Glossary

AV : Added Value

DES : Direction des équipements et systèmes

ERP : Enterprise Ressource Planning

LRU : Line Replaceable Unit (The piece removed from the plane)

NAV : Non Added Value

NFF : No Fault Found

SPT : Shop Processing Time
5) Presentation of the service

I am working for the DES (Direction des Equipements et Systèmes) project within the Customer Support Service (Figure 6-Camera produced by the DES service of Latécoère).

![Camera produced by the DES service of Latécoère](image)

Figure 6 - Camera produced by the DES service of Latécoère

The aim of this service is to repair or to replace products that are sent back by customers (either airplane companies or aircraft manufacturers) within a certain period of time: the shop processing time: SPT (Figure 7-SPT explanation). This period of time is contractual and must be respected.
This service is composed of several entities such as the reception, the repair station, the customs, the expert assessment ... There are 4 typical cases in the process of the customer support:

- No fault found: "NFF": There is no problem found in the equipment after the expertise, so the product is sent back to the customer without any repairs done on it. In that case, the expected SPT is 3 days.

- Repairing: the product received has some damage. The product is repaired and sent back to the client. The SPT in that case is 10 days.

- Standard exchange: the product received has some damages, so another similar product is sent back to the company while the original product is repaired. The original product, once repaired, is kept for stock by Latécoère in order to be used for another standard exchange. The SPT is also 10 days.

- Evolution: the product has no damages, but it must receive an update. If the request for an update is accepted by the client, the product is modified so then the SPT is 10 days, if it is refused, the equipment is sent back as it was to the client and the SPT is 3 days.
This service is organized in several entities.

- The reception who is receiving the different equipments (for the production and for the customer support). When an equipment is sent from the Europe, it is given to the repair station, and when it is sent from outside of the Europe, it is sent to the custom service.

- The custom service: Its role is to clear the equipment from customs after the reception, and before the expedition.

- The repair station: it is the central entity of the service. It is present during several steps of the flow and has a role of coordination between the other services. After the reception of equipment, the repair station creates a job order. A job order is a document linked to equipment that will give him an identity within Latécoère. It has a specific number and contains all the important information concerning the product (owner, equipment nature, production date...). The repair station is also creating and publishing the OF (“ordre de fabrication” in French, which means “manufacturing order” in English). There are two kind of OF in the product support service: the ZP09 that is made for the assessment of an equipment, and the ZP11 that will describe the operation to do during the repairing of the equipment. They are both specific to a product because every damages are unique. If there are repairs to do, the repair station is usually proposing a standard exchange to the client. Finally the repair station is also present in the expedition flow in order to close the OF, to pack the equipment, to write the shop report that contains all the operations that have been done on the product ...

- The assessment platform: the platform is composed of technicians. They are receiving the products from the repair station with a ZP09 and have to perform the test of investigation in order to identify and locate the problem. If damage is identified, the technicians of the assessment platform inform the repair station about the problem, and the repair station write and send them back a ZP11 as explained here above. Some other technicians specialized in the repairing of the equipment will perform the reparation, following the ZP11 instructions and finally send back the product to the repair station once repaired. The assessment platform technicians are also working for the production flow.

- The commercials: they are writing and sending the repairing command to the clients.

- The sells administration service: they are sending the invoices to the customer and make sure that they are paid.
51) **Lean management in the service**

According to their contracts with customers, Latécoère is supposed to send back the DES products under ten days; this is the shop processing time (SPT): the period of time between the reception of the product and its expedition. A study about the SPT showed that it is way higher than it should be and that customers were losing their confidence in Latécoère. This is the reason that made Latécoère decided to implement the lean management in the Customer Support Service. In June 2012, a lean expert (Audrey BESSAC) started the VSM in the service.

The VSM team is organized as followed (Figure 8-VSM actors)

![VSM actors diagram](image_url)

**Role of the different groups:**

- **The Steering committee** keeps a macro overview of the different solutions thanks to the progress meetings. Its role is to help making a decision, to support the working group in case of difficulties and to unblock the critical points.

- **The proposer** follows the progress of the different ongoing actions. He helps project manager and the working group to set up the actions.

- **The project manager** will report the progress of the workshop to the methodological support and to the proposer in order to help them to make decisions. He is in charge of the steering of the project. He is the intermediary between the steering committee and the working group.
The methodological support will answer the questions of the different actors in order to guide the working group in its continuous improvement approach. He will set up the chosen solutions with the collaboration of all the actors.

The working group actively participates to the resolution of the malfunctions and to set up the actions. It is the most important link of the chain.

52) **Job done before I arrive in Latécoère**

There are 5 steps in the VSM, using the DMAIC method (Figure 9 - DMAIC)

![Figure 9 – DMAIC](image)

Before I arrived in Latécoère, another engineer was the project manager of the VSM. The two first steps of the projects were done.

521) **Ishikawas**

The different problems in the process had been identified and reported in a file. This file contains the list of all the problems, the service impacted (repair station, customs...) and also the frequency they happen and their impact on the process, in order to classify them according to their level of priority. The most critical problems will be analyzed first.

Several meetings have been organized by the project manager in order to write the Ishikawas. These meetings were lead by the project manager and the methodological support. The aim of the Ishikawa is to describe a problem in the process by listing the causes of the problem and its environment: labor, method, material, environment, maintenance, machines. The problem is explained and some potential solutions can be written in the Ishikawa.
522) VSM

The current state VSM (Figure 10-Current state VSM) shows the whole process, including the different times (Cycle Time, Lead Time ...) the flow of information and the flow of products from the supplier to the customer who are in our case the same company. All the different cases have been drawn in the same map (NFF, standard exchange, repairing, evolution). In the same time, the Ishikawa previously drawn are placed on the map in order to visualize where they happen in the process.

![Figure 10 - Current state VSM](image-url)
6) Theory

This theory comes from the discussions I had with the Lean expert of Latécoère, and the intern documents of Latécoère concerning Lean Manufacturing that have been used as references.

61) Added Value

The added value (AV) is one of the key concepts of the Lean manufacturing approach. It is used as guideline all over the achievement of the VSM. The AV can be defined as what the customer is ready to pay in order to fulfill his needs. The company shall focus on this value that corresponds to the necessary operations in order to transform the rough material into a finished product (Figure 2 – Lean goals).

![Flow with AV](Flow with AV)

![Flow without AV](Flow without AV)

![Necessary](Necessary)

![Unnecessary](Unnecessary)

Optimize

Reduce

Eliminate

Figure 2 – Lean goals

By applying the here above method, the composition of the processes in a comparative traditional approach / Lean approach could be illustrated as follow (Figure 3 – Traditionnal Vs Lean Approach):

![Traditional Vs Lean Approach](Traditional Vs Lean Approach)

Figure 3 – Traditional vs Lean approach
62) **Value Stream Mapping**

The Value Stream Mapping (VSM) is a graphic illustration of the products and information flows of an overall activity. This mapping represents the sum of the actions with or without added value that enable a product to be transformed from the raw material to the finished product (Figure 4 – Product flow).

![Figure 4 – Product flow](image)

The goal of VSM is to answer in the most efficient way to the customer needs (costs, flexibility, quality ...) by optimizing the interface between the different entities of an activity and also by identifying the losses of efficiency and the wastes in order to reduce or eliminate them.

63) **Concepts of VSM**

VSM is an analysis tool used for simple and logical flows. It is used all over the world and uses a set of normalized icons that ensure a common language. VSM is based on a participative approach. After having define the study area, it is necessary to constitute a multidisciplinary working group showing all the different functions that are included in the study. Nobody can actually better define an activity than the one doing it everyday! A VSM project is composed of four principal steps (Figure 5-VSM process) explained here after.

![Figure 5 – VSM process](image)
64) **Current state**

The first step of VSM consists in formalizing the current situation. This first mapping is called “current state”. All the operations realized in the activity must be detailed and formalized according to the reality. On this mapping shall appear the physical flow, but also the flows of information and the steps between operations (waiting, storage...)

This step enables fixing a mapping showing the activity at a certain time and therefore to provide a unique support to discuss about the process. Moreover this mapping is an overview of the process that considers the performance of all the operations included in it. As a consequence it enables avoiding the compartmentalization between the different actors of a single activity.

During this step that consists in analyzing the existing situation, it is necessary to fix the area and the needs of every actors of the flow. The detail of the posts enables a complete and detailed description of all the tasks done on one post and the resources required to their realization (material, information, tools...)

65) **Identification of the malfunctions**

The next step consists in identifying and isolating the dysfunctions so we can define all the improvement to perform. During this step, the aim is not to bring solutions but just to focus on the loss of performance. It is necessary to identify well the malfunctions in order to be able to adjust the solutions according to the constraints of each actor.

66) **Future state**

The working group can then perform the mapping of the future state. This mapping is the representation of the perfect flow once the wastes and malfunctions eliminated. All the operations required to perform the studied process need to be cadenced according to the takt time. This future mapping, cadenced, perfect and cleared of all the loss of efficiency is the target to reach.

67) **Action plans**

After the creation of the future state map, one needs to fill in the Lean Action plan. All the malfunctions need to be listed and commented in order to keep as much details and clarity as possible. We need now to find out solutions. Sometimes these solutions can be evident and a root cause analysis may not be relevant. Nevertheless we need to be watchful and take the time to think about the constraints created with the setting of a chosen solution. When a complex issue is discovered, we need to analyze its root cause. All the actions need to be listed in the action plan. They need to be prioritized. It is possible to use different prioritization matrixes, depending on the constraints specific to the project and the objectives. The most common prioritization matrixes will be articulated according to the cost, the efficiency and the difficulty to set them. Once prioritized, these solutions are transformed into actions in the action plan. Each action needs to have one or several people in charge of taking care of it, a starting date and a date to check out the efficiency of
the solution once it is set. If the efficiency is not proven, we will have to start again the approach in order to adjust the solution and to get the expected results.

7) **Work done during my thesis in Latécoère**

71) **VSM project**

711) **Re-work of the current state VSM**

All the flows that are mentioned above (except the case of the evolution that wasn’t taken in account) were in the same VSM, making it unclear and complicated to read. In order to make it clearer, I decided to split the global VSM in two VSM, one concerning the standard exchange, and another one for the repairing Figure 11 - Simplified version of the current state VSM - Standard exchange.

![Figure 11 - Simplified version of the current state VSM - Standard exchange](image)

The here above drawing shows the very simplified version of the flow of an equipment in the customer support service. Once the product is received by Latécoère, it is sent to the assessment service that will test it in order to check if the equipment truly has a problem. If it doesn’t show any
problem, the equipment is sent back to the client (NFF). If the equipment has some damages, it is sent to be repaired, and in the same time a standard exchange is proposed to the client. Finally, the repaired equipment is stored in order to be used as a standard exchange for an equipment sent for repairing.

712) Future state VSM

Once the current state VSM had been drawn, I organized several meetings with the working group. I split the working group in several groups of people working within the same entity (reception, repairing...). The aim of these meeting was to draw the map of the process that would be considered as perfect for them (Figure 12-Creation of the future state map), considering their experience and the Ishikawas. Here we are not talking about money or space available in the factory, but just about what modification in the process could make it the most efficient.

![Figure 12 - Creation of the future state map](image)

My role during these meetings was to lead the discussion, to make everybody express his opinion. It can be really hard to make an employee describe how his work could change when he is doing the same job for decades and he feels like his task can’t be changed. I was also in charge to transcribe their vision of the process into its drawing.

After the meetings, I draw the Future State VSM that I split again in two linked maps: one for the standard exchange, and another one for the repairing. These maps are in Appendix 3 and 4.

72) Preparation of the steering committee reunion

721) Analysis of the future state VSM

The next step of the VSM project is to compare the current state VSM and the future state VSM in order to calculate the gains to obtain in term of reduction of the lead time: Added Value (AV) + Non
Added Value (NAV), in term of reduction of cycle time: AV, and in term of ration AV / NAV. The aim is also to reduce the number of steps in the process in order to simplify it (Figure 13-Expected results).

The here above drawing shows the reduction of the lead time that includes the adding value processes and the non adding values processes. We can also notice that in the future state map, the t0 of the SPT is at the real beginning of the process and not a few steps after as it is in the current state VSM, I will explain the reason why after. The part of NAV is supposed to go from 95% to 25% of the global process (figure 14-Proportion of AV)
Prioritization Matrix

Now that the objective is fixed, the next step is to find the actions to put in place in order to reach a process that is as close as possible of the future state VSM. One way to find these actions and to evaluate their impact on the process is to realize a prioritization matrix. The prioritization matrix is composed of the list of all the potential factors that could have an influence on the process (the performance of a machine, the availability of an operator...) that are listed in abscissa, and the list of some relevant performance indicators (KPI) that are placed in ordinate. The factors in abscissa have been chosen with the help of the Ishikawas. In fact, the Ishikawas are used to highlight the problems of a process and to describe them, so starting from that I listed all the root causes of the problems underlined in the Ishikawas to use them as influence factors.

Then, at the cross section of one factor of influence and one KPI is written an influence grade (for instance a number from 0 to 10, 10 being a huge influence, and 0 being no influence). Then the addition of all these grades is made for each factor in order to estimate the impact of one factor to the global efficiency of the process. The matrix of the process figures in Appendix 5. The graphic shown here below is the illustration of the prioritization matrix (Figure 15-Identification of the most influent factors).

Figure 15 – Identification of the most influent factors
722) Explanation of the different factors

1- Tracking of the equipment, starting at the expedition from the Airline

The equipment is currently sent by the airline to Latécoère without any pre-alert. So Latécoère never knows in advance when the equipment is arriving in order to be repaired. It leads to many problems. In fact, the repair station can’t have any global overview of the incoming equipments, so it can’t foresee and adapt the stock available for the standard exchange. It is easily understandable that we can’t allow ourselves to wait 5 days for an available product in stock for a standard exchange, when the SPT is 10 working days. It is the same problem concerning the platform, the technicians can’t adjust the stock of spare parts to replace the spotted ones. Another problem is the knowledge of the SPT. In the current situation, the SPT is starting at the creation of the Job Order, whereas it should start as soon as the equipment is arriving at the reception service. There are often a couple of days between the reception of the product and the creation of the Job Order, so the SPT that is measured is actually shorter than the real one.

2- Communication between the repair station and the assessment platform

It is one of the key steps of the process. Each of these two services has important information for the other service, therefore it is fundamental that a perfect transparency remain between the two actors. Every week, the repair station is updating a board with all the equipment to assess and to repair, and classify them in term of prioritization. This prioritization is important, it is made regarding several factors : the client (some are more demanding than the others), the stock available for a standard exchange (if there is no stock for a standard exchange, the equipment should be repaired extremely quickly and sent back to the client, so it should be repaired before the other equipment that are repaired for stock)... In the same time, the technicians in the platform know the progress of the assessment and the repairing and should keep the repair station updated about the different problems that happen so the repair station can advice the client in case of problem.

3- Duplication of the data bases

Latecoere is using several softwares, ERP (enterprise resource planning) and databases depending of the service. It leads to a lot of duplication between the databases. The problem being that these databases don’t automatically synchronize so the updates made on one software / database don’t appear in the other databases.

4- Test bench availability

There is only one test bench for the assessment whereas there are two technicians working on it. It sometimes happens that a technician has to work on an equipment and there is no bench available for it.

5- Disassembly complexity of an equipment

There is nobody who is officially in charge of the disassembly of the equipment. It is usually the technicians of the assessment platform who are doing this job. It sometimes happens that the screws are oxidized so it is impossible to unscrew them. As a consequence the equipment must be sent to the aerostructure repairing service where they have the specific tools to disassemble the equipment.
Some equipments also require two or three person to be disassemble because of the lack of means (vices, specific table ...) so it represent as much time lost for the assessment of other equipments.

6-Failure investigation methodology

The technicians of the assessment platform are systematically performing investigating tests when receiving an equipment in order to locate the damages. The operations of the test are not the same for all the equipments, depending of the product nature, of the results all along the tests ... But there is no official methodology to do it. An official methodology of failure investigation

7-Warehouse procurement (planning, missing items, production Vs support management)

Both production and support flow require the same items but sometimes the stock doesn’t allow a correct procurement of the two flows. It is quite easy to predict the consumption of items for the production whereas it is only possible to assume the support consumption with a statistical analysis.

8- Someone dedicated to the opening/ closure of the equipments

The opening of an equipment approximately lasts 1h30min and Latécoère receives in average one equipment per day to repair, so the technicians spend 1h30min out of 7h45min of working hours per day to disassemble an equipment instead of working on it, even if it is not normally their job to do it.

9-Assessment: personnel availability

The bottleneck of the flow is for sure the assessment platform. An equipment usually waits several days before being assessed. It takes more than one day to perform the investigation test. Until June 2012, there were only one person in the repair station publishing the ZP09 and the job order. Therefore there was almost no customer support activity within the assessment platform. In July 2012, another person has been hired in the repair station so the amount of equipment sent to the assessment platform quickly increased

10-Global tracking of the equipment

All along the process flow within Latécoère, the equipment is moving from several services to the others (reception, customs, repair station, platform, repair station, expeditions...) and we noticed that a lot of time is lost during all the transports because the role of who is taking care of the transportation of an equipment from one service to the other is not clearly defined in the posts. That leads to a lot of time lost for the technicians that need to take charge of the transportation of the equipments even if it is not their job to do it.

11-Using a reception/expedition station instead of the warehouse when receiving/sending the equipments

When an equipment needs to be sent from Latécoère, it is usually brought from the repair station to the warehouse where it can be stored for a couple of days until it is sent to a shelf in the factory where a train is going to two times a day to pick up the equipments and send them to the expedition service. This storage in the warehouse and on the shelf doesn’t have any added value. A solution was to set up an reception/expedition station inside the forklift (the repair station is at the third store of a
building, and the expedition service is in another building). So then people from the repair station just have to put the equipments on a shelf inside the forklift, and several times a day, someone from the expedition service can come to check if there are some equipments to send that are inside the forklift. It will ensure that an equipment that is put in the expedition station before 3 p.m by the repair station is sent from Latécoère to the client the same day.

12-Visual Management on the packages
The packages that arrive in Latécoère are full of labels that make them completely unreadable. People at the reception station can only notice the DES equipments thanks to their experience. It is really important for the DES equipments to be treated apart from the others because of the SPT of 10 days that make these equipments way more urgent than the others. An illustration of this problem happened during my internship. An equipment that arrived the 15th of April in Latécoère had been sent to the repair station only 4 days after, so almost half of the SPT because people didn’t notice it was a DES equipment. This example underlines the importance to clear the packages from all the useless labels, and put special ones that are peculiar to the DES products.

13-Custom area in the repair station
The equipments coming from outside the EU need to be custom cleared. These customs could be in an airport, but here in Latécoère we do have customs, so the equipments arriving from outside the EU have to be kept in the custom area in the reception zone, then employees from the custom service come to the reception zone, take all the required documents, go back to the custom service, and once the equipment is custom cleared, they allow people from the reception service to send it to the repair station. A solution to save some time could be to create a custom area within the repair station, if the tracking of the equipment (action plan -1) is set, it would be possible for the custom service to clear the equipment from custom without having the need to come to pick up documents at the reception service. So basically an equipment under customs could be sent directly from the reception to the repair station while is it cleared from customs in the meantime. Once cleared from customs, the equipment would already be in the repair station, with the JO already created and so then ready to be sent for the assessment.

14-Personn dedicated to the PR (water tightness) and the painting
This factor is close to the tenth factor because it deals with work that is made by the technicians of the platform even if it is not in their post description. An equipment that had been repaired (so opened) needs to get some PR to ensure its water tightness and it also sometimes needs to be painted. This job is currently done by the technicians even if it shouldn’t, and that represent a lot of time lost for them that could be used to assess new equipments.

15- NFF policy
There are several cases to treat. An equipment is under warranty three years after its purchase, so all the repairing costs go back to Latécoère during this period. The contractual time for an NFF product to be treated is 3 days. And it is impossible to achieve it in 3 days because it corresponds almost to the duration of the assessment tests. So there are several policy that could be put in place. Latécoère could send a standard exchange in every case. In this case even the product without any damages
would be replaced by new equipment and sent back to the client, the advantage is that it would enable a certain gain of time (the assessment time) and the SPT of three days could be respected.

### 723) Classification of the factors

An arbitrary level has been chosen to decide the minimum level of influence a factor should have in order to be considered as “high influence factor” (Figure 16-Identification of the factors). Setting this level too low would lead to take into account almost all the factors, which is impossible in the first time, whereas setting the level to high would make only a couple of factor as “high influence factor” and so to a limited amount of actions to perform in the first time. We decided to set the level of minimum influence at 25. So basically, all the factors over this level are considered has having a high influence on the SPT and should be taken into account in priority. All the here above factors have been placed in a graphic in order to classify them in term of gain and of investments. That enabled us to define the quick wins. The quick wins are the factors that potentially could provide a lot of gain in term of SPT, with a low investment. These factors, such as the “high influence factor” should be taken in account in priority (Figure 17-Factors of influence to take into account).

![Figure 16 – Classification of the factors](image-url)
Once all the work previously explained done, I organized a steering committee reunion. The aim of this reunion was to explain to the manager of the different services, the gain that they could get by taking into account these quick wins and factors with high influence. The steering committee finally agreed after the reunion to let the VSM project manager to set up action plans for all these criteria.

**7.24) Steering committee reunion**
73) Action plans

731) Presentation
Since all the propositions of improvement had been approved, I organized several meetings with the VSM project manager. During these reunions we were talking about one action plan per meeting with the presence of all the actors concerned by this action plan. In each reunion we first presented the report of the steering committee reunion so all the employee who helped us in the first steps of the VSM project could be aware of the decisions made by the manager considering the work we previously did together (Ishikawas, current state map, future state map...). Then we all thought about what could be done in order to solve the problems underlined by the factors of influence. These reunions are really important because no one knows better what could be improved in a job than the one actually performing it. It can be really tough to get answers from some people. For example some employees that have asked for years their superior about some changes they would like in their job that could improve their efficiency or even the ergonomics of their tasks, and that have never been heard or taken in account. These people can become jaded and indifferent now because of that, and it is really hard to make them trust that things now can change. Then, I spent the main part of my internship to set up these actions.

732) Actions set-up

1-Tracking of the equipment, starting at the expedition from the Airline
We first thought about two solutions that could be used to phase in the tracking of the equipments.

At the beginning we wanted to create an exchange portal in which the airlines could log in and write down all the relevant information that could enable Latécoère to create a job order in advance, to receive the product more efficiently and to get prepared for a standard exchange. The problem is that the Airlines have dozens of suppliers like Latécoère and can’t use one different portal per supplier. So spending a lot of money by creating this portal would be useless if no company would agree to use it.

As a consequence, we decided to use OneAero which is an exchange portal used by 90% of the Airlines. In this portal are put several models of documents. So it would be easier for Latécoère to subscribe to OneAero and to create our own form. It is then possible to link this OneAero form to SAP (the ERP used by Latécoère). This solution is really interesting because it won’t change the habits of the Airlines, using OneAero is really cheap, and we can customize the form in order to get only the information we actually need.

2-Communication between the repair station and the assessment platform
Both the repair station and the assessment platform were complaining the lack of communication between the two services. I organized some meetings with persons from each service to ask them exactly what can of information they want, when, and why. To solve these problems, I created a model of mail to be used by the repair station to update the level of prioritization of the equipments.
to assess. A daily meeting has also been set up to discuss about the progress of the repairs, the stock of the components...

3-Disassembly complexity of an equipment
All the equipments must be sent to the Aérostructure in order to be disassembled. In fact, it is not the job of the technicians of the assessment platform to do it. Once the product assessed, someone from the repair station must come to bring the equipment from the platform to the Aérostructure zone where they have all the required tools to open it. As a consequence, the technicians from the platform can spend more time to assess the incoming equipments and the repair station is kept updated of the progress of the equipment within the repairing flow.

4-Failure investigation methodology
An excel file has been created with the list of all the equipments, and the subassembly. For each component several information such as the price, the level of investigation asked by the contract, the REX (return on experience) on the same products that have already been repaired, the difficulty of repairing ... Depending of all these data, it is possible to apply some rules to set the level of investigation of the technicians on the equipment to repair. For instance, an equipment costing 10€ but requiring 10 hours to be repaired should be automatically replaced.

5-Warehouse procurement (planning, missing items, production Vs support management)
Once a week, a “forecast and planning” reunion is organized with the DES project manager and the managers of the repair station, the platform and the material support in order to check the stock and especially to define the rules concerning the management of the spare equipment (expiration dates...).

6-Using a reception/expedition station instead of the warehouse when receiving/sending the equipments
We have decided to create the station inside the goods lift (the repair station is in the third floor, and the expedition service is on the ground floor. Once the equipment is repaired and ready to be sent by the repair station, it is placed on a dedicated shelf in the goods lift and a mail is sent to the expedition service so they are aware that an equipment is at their disposal to be sent. The process is the same for the reception. It will avoid the problems that sometimes occurs when equipment spend up to four days, stored somewhere, just waiting to be sent by the expedition service.

7- NFF policy
The NFF policy is described in the here-above matrix (Figure 18 –Policy of the different types of flow)
733) Follow-up of the action plans

We used an excel file to report the progress of the different action plans. All the steps of each action plan are written down with several information such as the actors, the starting date of the action, the expected finishing date, the progress of the action. Then, a graphic enables visualizing the global progression of the action plan, and if we are late or not. (Figure 18- Visualization of the action plans)
<table>
<thead>
<tr>
<th>Type</th>
<th>Actions - Solutions</th>
<th>Date Début</th>
<th>Commentaires</th>
<th>Pilote</th>
<th>Acteurs</th>
<th>Etat Réal (%)</th>
<th>Date Objet</th>
<th>Etat Prévision</th>
</tr>
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<tr>
<td>INDICATEUR LEAN</td>
<td>Validité l'implémentation de la gare d'expédition</td>
<td></td>
<td>Changer le lieu de dépôt des équipements par la station de réparation</td>
<td>Thomas Cadro / Jean Noel Robert</td>
<td>SOFLOG, Rudy Mouilo, Mohamed Mountahi, Gregory Gaj</td>
<td>34</td>
<td>22/04/2013</td>
<td></td>
</tr>
<tr>
<td>Réunion d'avancement</td>
<td>Réunion d'avancement</td>
<td>03/04/2013</td>
<td></td>
<td>Thomas Cadro / Jean Noel Robert</td>
<td>SOFLOG, Rudy Mouilo, Mohamed Mountahi</td>
<td>100</td>
<td>03/04/2013</td>
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<tr>
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<td>Création de la gare d'expédition au FISCL</td>
<td>15/04/2013</td>
<td>Définir un responsable opérationnel et un responsable fonctionnel</td>
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<td>50</td>
<td>19/04/2013</td>
<td></td>
</tr>
<tr>
<td>Délair quelqu'un au transport</td>
<td>Délair quelqu'un au transport</td>
<td>22/04/2013</td>
<td></td>
<td>Thomas Cadro / Jean Noel Robert</td>
<td>SOFLOG, Rudy Mouilo</td>
<td>20</td>
<td>22/04/2013</td>
<td></td>
</tr>
</tbody>
</table>

Figure 19 – Visualization of the action plans

<table>
<thead>
<tr>
<th>Action</th>
<th>Expected starting date</th>
<th>Comments</th>
<th>Pilot</th>
<th>Actors</th>
<th>Progress</th>
<th>Expected finishing date</th>
</tr>
</thead>
</table>

Progress, Lateness, Done, In progress
8) Results (Evolution of the KPI)

Nota: No figures will appear in the following histograms in order to preserve the confidentiality required by Latécoère.

As an Aircraft manufacturer (We will call him “X”) was complaining about the customer service, they asked Latécoère to report some KPI concerning different data (Figure 20- Evolution of the X repair performance):

- **Performance**: it is the ratio: 

- **Qty delivered**: it is the number of products sent back
- **Qty on time**: it is the number of products sent back on time
- **Qty overdue**: number of product sent back late (SPT > 10 days)
- **Total qty of day late in WIP**: it is the product of the number of on-going equipment that are already late (SPT > 10 days) by the amount of day late of all the on-going equipments.
- **WIP**: the on-going equipments
- **Objective**: It is the aim concerning the performance

![X Repair Performance in 2013](image)

*Figure 20 – Evolution of the X repair performance*
We can first notice that the performance is really under its expectations even if real improvements have been done since the beginning of the VSM project. One reason that could explain this low performance is the frequent refusal of airlines concerning the standard exchange. The VSM showed us that even with a perfect process it is almost impossible to reach an SPT of less than 10 days if we don’t do a standard exchange (Figure 21-Evolution of the X SPT). The aim is to propose a standard exchange in all the cases and as a consequence, to repair the equipment in order to widen the stock (without any specific repairing time expectation).

Since March 2013, the SPT average in the case of a standard exchange reached the aimed SPT. The graphic “Evolution of the SPT in 2013” illustrates the fact that the performance is not bad because of the standard exchange SPT, but because of the more and more frequent refusal of the company to proceed a standard exchange. A way to improve the performance would then be to change the contract with the airlines by removing the SPT expectations in case of a refusal of the airline to proceed to a standard exchange.

As we can notice on the histogram “Following of the hours spend and of the quantity of DES equipments within the customer support service “ (Figure 22- Statistics of the DES customer support), in July 2012, the WIP highly rose.
The main reason wasn’t the capacity of the assessment platform, but the lack of capacity in the repair station. A new employee has been hired in the repair station in July 2012 and the WIP has been divided by two. This histogram contains information that can be used to explain the evolution of the SPT. In fact the equipments used to be stored a long time, waiting for the creation of a job order. Since the prioritization method concerning the assessment is the FIFO rule, having a huge WIP undeniably lead to an important SPT.
9) Conclusion

This work was my first professional experience within the Lean Manufacturing field. It was very interesting to see how it is possible to improve the performance of a process by only applying basic tools. In fact compared to the situation one year ago, the WIP has been divided by five, and the SPT in case of standard exchange has been divided by thirteen. We can also notice the overall communication has been improved which enable the different actors of the process to work in a better atmosphere.

Since I have been hired as project manager in Latécoère, I will keep on working on this VSM project in order to reach the full customer satisfaction.
10) Appendix

101) Appendix 1: Organization chart of the customer support in Latécoère
Appendix 2: Current state VSM, global flow
Appendix 3: Future state VSM, standard exchange flow
Appendix 4: Future state VSM, repairs flow
### Appendix 5-1: Prioritization matrix

<table>
<thead>
<tr>
<th>KPI</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
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<td>6</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>10</td>
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<tr>
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<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>10</td>
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<td>5</td>
<td>3</td>
<td>3</td>
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</tbody>
</table>

| XI influence                     | 34 | 40 | 11 | 22 | 18 | 22 | 24 | 25 |
## Appendix 5-2: Prioritization matrix

<table>
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<th>KPI</th>
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</table>

X1 influence: | 40 | 12 | 30 | 23 | 32 | 25 | 16 |