

Maintenance Stream Process for Pont Airlines Engine Fleet

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Abstract — Starting in 2020, the new Alpha engines of the Pont Airlines will enter into maintenance. One of the facilities has been used as variable control for areas of opportunity in the following areas: maintenance procedures, proficiency and technology. To accomplish the time reduction, changes in the organization schematic, training and facilities has been identified and proposed. However, a validation or follow-up plan is necessary to evaluate the effectiveness of the plan.

Key Terms — Engine, Maintenance, Airline, Overhaul, Technician.

INTRODUCTION

In 1926, the regulation of commercial aviation regulations started with the Air Commerce Act by providing regulations, promotion and simplification. However, with the number of passengers increasing every year, the airline industry became a very profitable one. “Only between 2009 and 2014, revenue in the global aviation industry grew at a compound annual growth rate of around 9.5 percent, reaching 751 billion U.S. dollars in 2014” [1].

In this profited market, airlines work every day to keep the companies floating in this competitive industry. Each airline works very hard to maintain the planes in services as much as possible, avoiding situations that could put at risk the services provided to the passengers, possible fines from the regulatory commission and their reputation. In this fight is where the companies which provided the parts to assemble the plane step in. For example, if the aircraft software installed suffers a glitch, the company who sold the program usually offers the maintenance package and update services, as agreed in the contract between the company and the airlines.

“Commercial aircraft maintenance, repair and overhaul (MRO) is an essential requirement to ensure that aircraft are maintained in pre-determined

conditions of airworthiness to safely transport passengers and cargo” [2].

The overhaul process consists in several steps:

- **Work scope definition:** The first step is the arrival of a “dirty engine” (e.g. an engine with more than 3,000 cycles in service). The work package is discussed in detail with engineering, production team and the customer. The results are an overview of all the work that needs to be done.
- **Cleaning and inspection:** This process involves several baths with different liquids to ensure all the dirt and oil is remove before the visual inspection. One of these is a borescope inspection, a camera is used to perform the internal examination.
- **Engine Disassembly:** this process starts with the disassembly of static parts and rotating parts and concludes with the mayor components.
- **Repair and Replace:** Here the life- limited must replace with new ones. Sometimes, parts can be repair in site at the repair shop.
- **Assembling and Testing:** In this last step, the engine is rebuilt and goes into final test under the toughest conditions and all kind of circumstances. When the engine receives the certification, the cycles counter back to zero and returns to service.

In the everyday business, keeping planes in services means the time for the engine maintenance is becoming more constricted. This is the new challenge for the overhaul facilities and their work with the airlines.

The challenge has been started with Pont Airlines. This airline brought around 200 engines in 2012 for their new two-engine airplane to increase their presence in Asia. Though, in 2020 these engines will reach the 3,000 cycles, meaning the

engines will need to receive maintenance. But these are not the only ones. This airline also has older engines in service with their own maintenance requirements. This increase will cause an overload in the maintenance site, while the airline wants their engines as soon as possible.

For this project, different areas of the maintenance process will be evaluated to reduce the time between the engine's arrival and the final delivery. The areas to be evaluated for this improvement will be the current maintenance procedure, personnel proficiency and areas of opportunity for recent technologies.

LITERATURE REVIEW

For the project purposes, three areas have been identified as possible areas of improvement that could lead in the maintenance decrease time.

The first area is the maintenance process itself. One of the maintenance location in Asia was selected to evaluate and use as point of focus for the project. The first data evaluated was the engine schedule of the current engines of the airline. Something that showed immediately was the inconsistencies in the maintenance time. Usually, the entire maintenance (as soon the engine arrives until it leaves the facilities) is around 2 weeks. The log showed waiting times from two weeks to two months. The major hits occurred between November and January. Further investigation presented lack of the technicians availability, mostly because the high volume of vacations taken in that time. The issue caused an overstock with the engines arriving in high volumes the previous months.

The space known as storage consisted in two buildings with the capacity of twenty engines each. At the visit, around nine engines were placed outside and covered with a thick blue plastic (same used to cover the engine during road transportation).

The second area evaluated was the technician proficiency. As shown on Figure 1, more than 60% of the technicians have less than 5 years of experience.

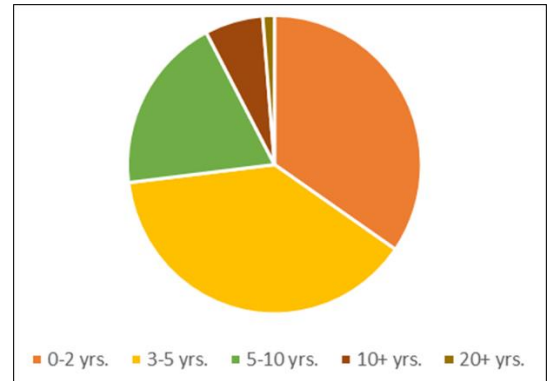


Figure 1

“X” Location Proficiency Analysis of the First Shift

While interviewing eight technicians, they manifested their concerns about the “on the job” training received with a senior technician instead of formal training (or desk training).

While walking around the work area, several observations were made:

- Hard copy manuals disperse around the work areas.
- Replacement parts without identification.
- Tools without outside their cases and not used.
- Lack of A/C.

ANALYSIS AND RESULTS

The engine maintenance capacity is good enough for 70 engine bays, 5 test areas and 150 pieces of machining equipment. Overall is close to old buildings own by the government. In recent years, government closed the edifices around the maintenance facility, these buildings were used as correctional establishments. However, to the lower criminal rate, the government closed these facilities. There, an opportunity has been recognized as a new expansion area.

Every time that one employee suffers an accident or identifies a medical issue, there is a one-hour stand down where the technicians receives an orientation of what happened and how to prevent that accident ever happens again. In this geography, the temperature can reach easily 90 Fahrenheit degrees at 9am. Due to multiple reports of dehydration and continuous stand downs, the facility is going to close the engines maintenance areas to

install A/C units and provide some comfort on the job stations.

To address the proficiency, it is required to identify the best candidates and provide the necessary tools; create a curriculum that includes the combination of engines procedures, field training and cross knowledge with senior technicians; but also a benchmarking with other maintenance companies could be considered. One company to consider is Lufthansa. They have a vocational program [3] where students can start their educational experience before graduating.

Management reorganization has been proposed as described in Figure 2, where the description of each position has the following descriptions:

- **Maintenance Lead:** from this position will covered and plan all the income- outcome engines maintenance over the Pont fleet.
- **Deputy Lead:** in conjunction with the lead, will verify the incoming information about the schedules for each fleet.
- **Legacy A, B and Alpha Engine Leads:** their work consist on manage the schedules for each individual engine on the assigned fleet. Each engine lead will have different leads under their organization to manage the different requirements of each engine, meetings with the part suppliers and coordinate the efforts (technician's availability, etc.)

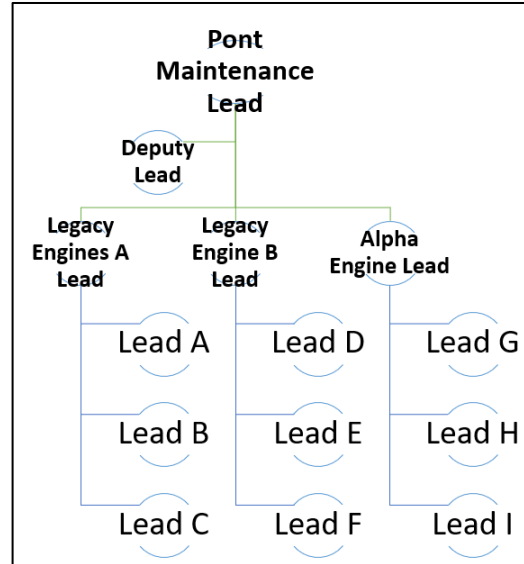


Figure 2
"X" Location Proficiency Analysis of the Firs Shift

For the work lay out, disorganization of the areas has been noted. In Figure 3, the working area layout consists of:

- **Information Area:** will include a desktop computer, reference area, and barcode system where the lead technician will organize day by day basis workday, check the schedule and check manuals available in a digital library system.
- **Work Desk:** area designate for tools, cleaners and other maintenance tools.
- **Spares Area:** where the replacements part where locate after the verification by the lead technician.

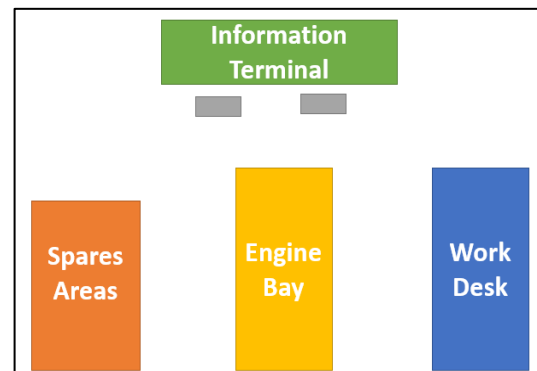


Figure 3
Working Layout Proposal

CONCLUSIONS

The project covers the identified areas that affect the maintenance process in this location. The technical work today is not going to change at all. However, in terms of training and schedule, these represents areas where the plan can make the difference.

Follow up plan to evaluate these improvements is necessary to evaluate these changes.

ABOUT THE AUTHOR

Yanira Solá Aponte completed her bachelor's degree in mechanical engineering in 2005 from the University of Puerto Rico, Mayaguez Campus. Soon after graduation, she started the first job in the aerospace industry as Structural Analyst in Infotech Aerospace Services. During her job in Infotech, she pursued and completed a master's degree in mechanical engineering from the University of Puerto Rico, Mayaguez Campus in 2014. She left Puerto Rico in 2016 and joined the United Technologies' division of Pratt and Whitney as Senior Engineer in East Hartford, Connecticut. Currently she is chasing a master in engineering management from the Polytechnic University of Puerto Rico to improve her skills, learnings and applications in her new role as Operational Commercial Engine Structures Lead.

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