

Abstract

The aerospace industry is a subsector of the defense industry that is fast growing and constantly evolving. One of the challenges faced in this industry is the obsolescence of electrical, electronic, and electromechanical (EEE) components, specifically planned obsolescence of commercial off-the-shelf (COTS) components. To manage obsolescence in a proactive manner, Company AEX's objective was to implement a relife process to use stored parts while ensuring reliability. Using a strategic planning methodology, Company AEX was able to create the relife process and implement it for its largest customer. This implementation resulted in a cost of \$350,000, and estimated savings of upwards of millions of dollars in fine avoidance and contract fulfillment.

Introduction

The aerospace industry is a subsector of the defense industry. It focuses on spacecraft such as launch vehicles and satellites, as well as commercial airplanes. It is a fast-growing industry in the United States, that is constantly evolving and fighting to keep up with the latest technology in the market. One of the major challenges faced in the industry is EEE component obsolescence, particularly for COTS.

Company AEX is an aerospace company based in Aguadilla, Puerto Rico. The facility has capabilities for manufacturing and testing. The company provides services to the United States government and collaborates with major aerospace companies as well as with other companies from the private sector. Due to the nature of the industry, Company AEX is heavily impacted by component obsolescence and had as part of its objective to transition from a reactive approach to obsolescence to a proactive approach.

Background

EEE component obsolescence is one of the major challenges faced in the aerospace industry. Many manufacturers have a planned obsolescence business strategy which directly affects the industry. Even when not planned, these obsolescence issues force aerospace companies to have to come up with mitigations and corrective actions for when obsolescence happens. COTS products, and more so in technology, have a product lifecycle of approximately two to five years, while space systems have a life of 25 to 50 [1]. Figure 1 shows an example of a product life cycle [2]. However, EEE COTS components typically reach the decline phase faster than assemblies are updated in the industry, creating a component obsolescence issue.

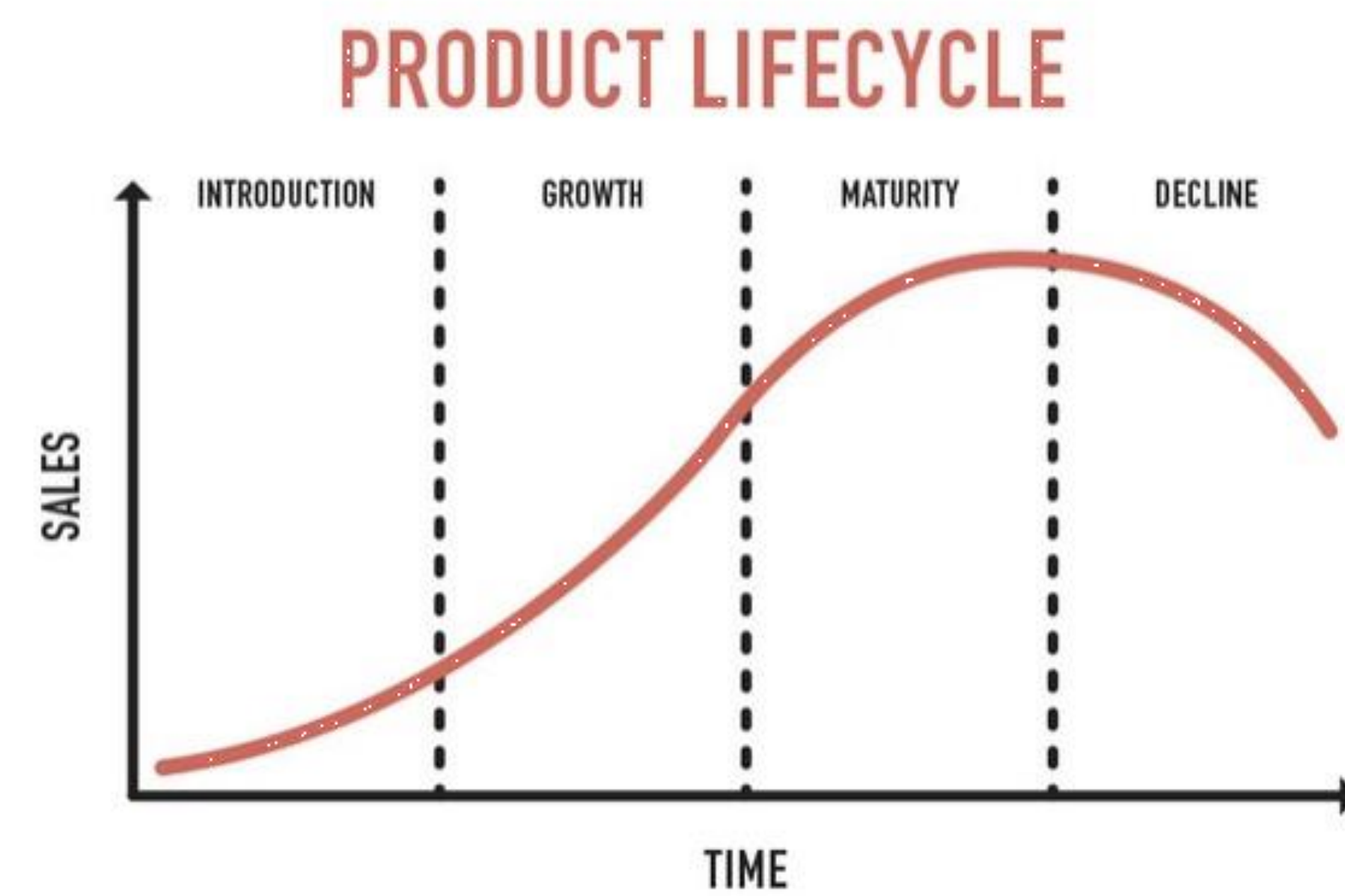


Figure 1. Product Lifecycle

There are many ways the aerospace industry tackles these challenges, including performing lifecycle analyses, buying military spec parts when available, ensuring they have end-of-life (EOL) notices sent regularly by manufacturers, ensuring the flexibility of designs and redesigns, considering alternate parts, and buying lifetime supplies of parts and relieving the parts as needed [3-4].

Problem

Considering EEE component obsolescence is one of the major challenges faced in the aerospace industry, Company AEX's objective was to move from a reactive approach to obsolescence to a proactive approach. This was to be achieved by implementing an EEE component relife process. This component relife process ensured the reliability of parts that were in storage for a long time (i.e., more than five to seven years, depending on the contract) so that they could be used without having to buy new parts. This relife process included storage specifications depending on the type of part, as well as testing of the parts. The company aimed to implement this process immediately after obtaining customer approval.

Methodology

To complete the project's objective, a strategic planning methodology was followed. This process involved defining the vision, establishing an objective, and goals to achieve this. Since an opportunity for improvement was identified, the objective was divided into smaller steps or goals to achieve the objective. The steps included: Creating a relife document; Presenting the document to the customer and obtaining approval; Following document procedures including testing, storage, and document findings; Lastly, customer review for approval. After the successful completion of these steps, the objective was considered implemented.

The creation of the relife process document took the component engineers three weeks to complete. It included extensive research on different EEE parts, as well as a deep understanding of the contract and regulations that had to be followed to comply with government law. The document was then presented to the customer, which provided feedback and ultimately approved the document. The document was then released into Company AEX's internal system. After receiving work orders, the testing engineers began testing the sample parts for solderability, leak tests, electricals, and visuals, as well as making sure the parts meet storage requirements, and documenting everything according to the standards established in the relife document. Lastly, the customer reviewed the findings and approved of the process for contract implementation.

Results and Discussion

Company AEX completed its objective of implementing an EEE component relife process, effectively moving from a reactive approach to obsolescence to a proactive approach. The implementation of this process allows Company AEX to relife stored parts and use them in new builds without compromising the assemblies. This eliminates the risk associated with contract unfulfillment when pertaining to EEE components.

In terms of project costs, it was estimated that the implementation of this process cost approximately \$350,000, where most of the budget was spent on salaries of the engineers and engineering manager, dedicated full time on the implementation of the process. However, it was also estimated that not implementing the project could have resulted in fines up to millions of dollars for breach of contract or failure to deliver, or even loss of the contract itself, resulting in billions lost. Figure 2 shows the costs and projected savings for this project.

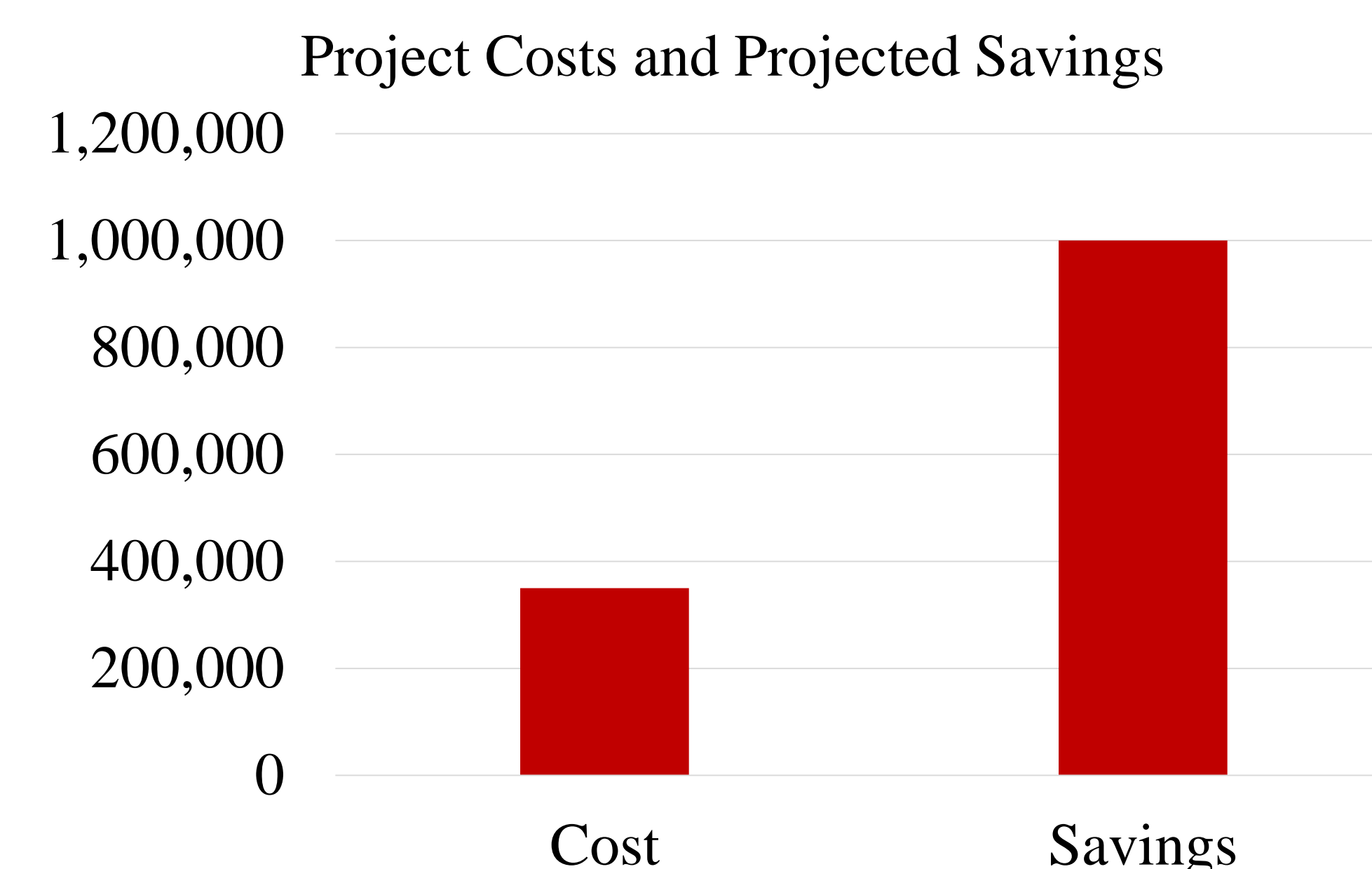


Figure 2. Project Costs and Projected Savings

Conclusions

The implementation of this relife process was an important step for Company AEX. With this implementation, the company moves from having a reactive approach to obsolescence, to having a proactive approach. Additionally, even though relife processes have different specifications and requirements depending on the customers, this first implementation established the basis for future implementations. This means that the engineers already know what to expect and what work is needed, and the engineering managers have a clearer expectation timewise and regarding the budget of the project.

Future Work

Next steps for Company AEX include implementing this relife process for other major customers. Due to customers having different regulations and contracts, relife specifications must be modified.

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References

- [1] COTS in space: Addressing obsolescence, part I | military aerospace, <https://www.militaryaerospace.com/commercial-aerospace/article/14229484/cots-in-space-addressing-obsolescence-part-i> (Accessed May 12, 2023).
- [2] "Using product lifecycle management software for PCB design," Altium, <https://resources.altium.com/p/what-pcb-designers-need-to-know-about-plm-integration> (accessed May 12, 2023).
- [3] R. L. Satow, "Aero Electronic Component obsolescence," The Boeing Company Official Website, https://www.boeing.com/commercial/aeromagazine/aero_10/elect_textonly.html#:~:text=It%20is%20estimated%20that%2060,useful%20lives%20exceed%2030%20years. (Accessed May 12, 2023)
- [4] "How industrial and aerospace and defense oems can win the obsolescence challenge," McKinsey & Company, <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/how-industrial-and-aerospace-and-defense-oems-can-win-the-obsolescence-challenge> (Accessed May 12, 2023).