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Managing Inventory (ACEA7006)

MODULE – ENGINEERING MANAGEMENT LEADERSHIP

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Abstract

The management of inventory is a critical aspect of business operations. This process involves the supply of spares and equipment to end users in suitable quantities, and within a required timeframe.

Effective inventory management can save a business money through reduced storage costs and downtime, minimise stock outs and over stocking, and improve cash flow (Wild, 2017)

This paper focuses on Toon Air and its supply of spare parts to end users within the business. Firstly, the current situation is critically evaluated to gain an understanding of what elements of the current service can be improved. It then moves onto the idea of outsourcing the management of the warehouse, the pros, and cons of entering an outsourcing contract are considered and evaluated, with consideration given to the areas of outsourcing that would require special attention. The performance measurements required to be in place between Toon Air and the supplier are then evaluated to understand where the difficulties of an outsourcing contract may lie. Finally, a list of recommendations has been compiled, outlining the areas of Toon Air's spares management process that can be improved upon and recommendations for future storage and distribution.

Introduction

All organisations keep inventory. Inventory is made up of raw materials, work in progress, supplies used in operations, and finished products. Storing inventory also brings with it other costs, financial outlay costs, storage space, labour costs to check, put away, retrieve, pack and ship, damage and obsolescence, and theft (Muller, 2011).

Inventory management is an essential part of business operations, planning, procuring, storing, controlling, and distributing goods allows a business to operate. Having an effective inventory management system allows these services to be effective whilst minimising costs.

It is important for a business to carry inventory to ensure the smooth delivery of services. Holding Inventory minimises risks against operations through delayed deliveries, provides availability of spares in case of breakdown or demand increase, becomes less susceptible to price fluctuations and provides greater flexibility to customer demand (Longeagne, 2022)

The three pillars of inventory management outline the steps of inventory management, they are planning, control and balance. Planning assists in determining demand for products, what items, and volumes of those items should be held, manage the parameters of those items to maintain stock levels, frequency of order to allow for lead times and minimum quantities, as well as safety stock. Control consists of physical movement of stock and documenting where that stock is, records of stock should be current, and physical inventory quantity should match the records on the database. Balancing deals with rates of supply and demand, and flow of material.

The importance of inventory management is integral to business operations from a financial, operational, and strategic perspective. The purpose of inventory management optimises inventory levels to achieve maximum profitability while ensuring that equipment is available in the correct quantity and time scale to provide an effective service to meet customer and end user demands.

This report looks at Toon Air and the options to improve the supply process of spare parts to end users, outsourcing options and the elements of outsourcing that would require performance measures.

Question 1

“Critically evaluate how the supply of spares to the end users can be improved?”

I feel that to optimise the service of supplying spares to end users requires a multifaceted approach.

De-centralised spare storage

The first point that needs to be addressed is that the spare parts required for maintenance are currently held in a centrally located warehouse that is 30 minutes from the nearest airport. I feel that if Toon Air were to develop a de-centralised storage system, this may improve the availability of available spares at the destination airports as well as the onsite maintenance site. If they were to have hubs based in their destination airports, this would allow them to quickly adjust the distribution network and delivery to the end users as required (Monitor Deloitte, 2020).

There are some pros and cons of using a decentralised spares store; the negatives include.

- Increased complexity – as the spares will be stored across multiple locations, this makes managing the stock more challenging as there will be more locations to manage.
- Increased labour costs – as the stock will need to be managed at multiple locations, there may be requirement to have more staff to undertake these tasks.
- Increase risk of stockouts – if stock across the locations is not managed correctly, or not booked out correctly, this could lead to having less spares than shown on the database, this could then lead to not having stock when the database shows that there is stock present.
- Reduced economies of scale – as stock will not be stored in bulk at a central store, this may lead to an increased purchasing cost as the ordered quantity won't be singular to one delivery point.

The positive impacts of a de-centralised spares store are.

- Increased availability – using a decentralised spares store increases availability at the required area, reduces potential delays and downtime that can be caused by long lead times. As the parts will be readily available, there will be less delays and downtime ensuring that less aircrafts are idle. Also, as more destination locations will have stock, there will be less reliability on the onsite spares, therefore maintenance can be carried out as planned with sufficient available spares.
- Reduced transportation costs – as the spares are closer to, or at the destination airports, this eliminates the costs associated with transporting the materials using a substitute aircraft.
- Removes engineers ordering spares – as the spares will be onsite, this will remove the need for engineers to order spares, allowing the purchasing system to operate more effectively.
- Improved resilience – the spares will be spread over multiple locations, this will create a resilient stock system if a natural disaster, theft or any other disturbance was faced at one location, there would be available spares at another site to help continue with maintenance.
- Improved flexibility – stock levels can be increased or decreased based on the demand of a single area whilst the other locations remain unaffected.

I feel that the positives of a decentralised spares store would greatly benefit Toon Air. Although there are some costs associated with more labour to manage multiple locations, potential greater complexity of system management and possible increase in material costs due to less of a bulk order, the positive impacts with increased availability of spares, reduced delays and downtime will more than counter act the negatives, the less chance of idle aircraft will increase services and therefore provide revenue which will also off set the increased labour costs to manage multiple locations.

The figure below depicts a centralised store and a de-centralised store. The centralised store is a singular node that does everything, in comparison to a network of nodes that all store and contribute to the spares network providing greater area coverage and availability.

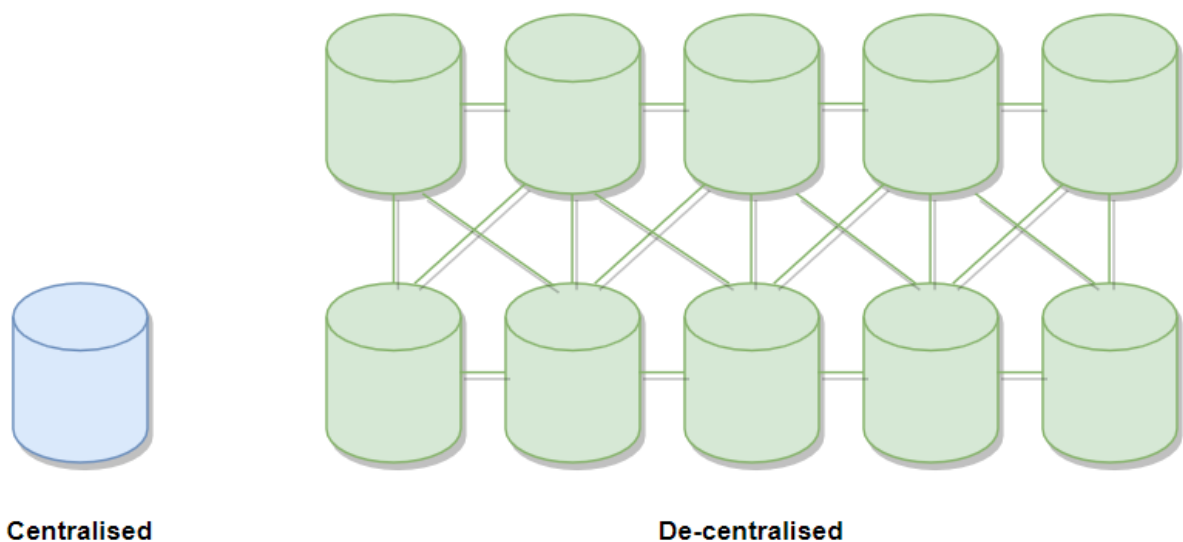


Figure 1 - Centralised vs De-centralised store

Improved inventory management system

Toon Air must hold sufficient quantity of inventory to guard against breakdown and fluctuations of spares requirement, the level of inventory management is very high, but much is unusable as there is a very high rate of technical obsolescence. I feel that the three pillars of inventory management should be reviewed to establish a suitable inventory management method and restructure. The three pillars of inventory management include inventory planning, inventory control and inventory balance.

Inventory planning is about determining the optimum levels of inventory currently needed and the quantity needed for future requirement. To do this you must understand the demand patterns and parameters to ensure that stock is balanced to incorporate safety stock and mitigate issues with lead times (Relph & Miller, 2015). This is not currently effective within Toon Air as there are delays because of not having spares available for maintenance. Further planning to ensure enough of the required parts is needed to ensure service levels are maintained and to avoid stockout.

Inventory control focuses on the physical control of stock, and data control is a key part of this process. When spares are sent to destination airports from the central store, this needs to be tracked, to accurately reflect where the stock is and where more is required. It is critical that the quantity of spares physically in stock is the same as the quantity held on system records (Relph & Miller, 2015). This will allow for reordering to maintain required stock levels for future maintenance procedures to be carried out. A more robust process is required as Toon Air have run out of spares and have faced delays because of late delivery of maintenance spares to destination airports.

Inventory balancing is concerned with supply and demand management (Relph & Miller, 2015). The rates of supply and demand should be reviewed regularly to ensure the flow of inventory is as expected and is correct. There must be a balance from supply of material to issue of spares to engineers. The rate of this process must be effective. The current system within Toon Air is not sufficient as there are times where spares are not available.

All three of these elements must be reviewed and altered to ensure the system works efficiently and effectively.

The figure below shows the three pillars, if any of the pillars were to be removed or weakened, the whole method will fail.

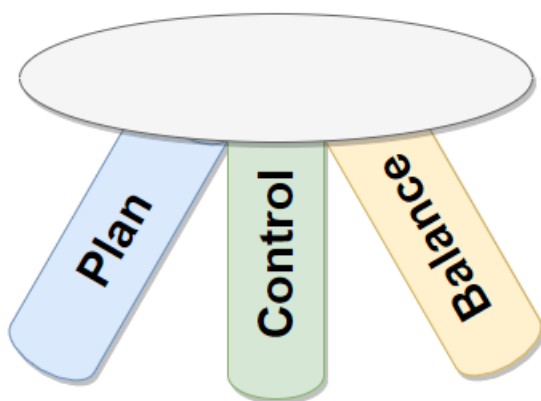


Figure 2 - 3 pillars of inventory management

To ensure minimal stock is carried at the stage of obsolescence, communication with aircraft manufacturers must be maintained. Demand must be forecast to ensure that when parts are no longer supported, it is timed that no further stock is carried, and only the supported spares are carried, storing obsolete and new spares is not cost effective or economical. As the aircraft industry is very heavily regulated, a good, working relationship with the spares suppliers is critical.

To ensure the required flow of spares, the re-order point must be reviewed, or a two-bin system implemented. The two-bin system can be set up so that there is a physical indication when more spares are required to be ordered. Either method should contain safety stock to ensure spares are always available.

Currently, engineers are ordering spares without a purchase order and without consulting the procurement department. This is happening as it is currently proving quicker to obtain spares without using the procurement department, this is only short-term gain, this does not help in setting up sufficient levels of future stock, so engineers don't need to order themselves. This method does not feed into the inventory management system, so the inventory can't be controlled. If the elements previously discussed are implemented, that would reduce the need of this happening. Ordering without a purchase order also removes the potential of negotiating costs of high value items, procurement departments are often able to negotiate purchase costs and payments terms which assists in the businesses cashflow.

All the elements mentioned above play a part in the efficient delivery of providing spares to the end users. If these elements were reviewed and the changes implemented, I feel that the supply of spares could be procured and delivered to the end users quicker and more efficiently.

Question 2

“The company is considering outsourcing the management of parts warehouse and supply of parts to the engineering functions. Advise, the company on what outsourcing involves and what particular areas would require special attention.”

Outsourcing is the allocation of business activities from an internal source to an external source, this includes the responsibility for the day to day running performance of these activities against an agreed set of standards, stated in a contract (Schniederjans, et al., 2007). When the outsourcing contract is in place, the control of these activities resides with the external provider. The services that can be outsourced must not be a core activity of the business (Kehal & Singh, 2006). Outsourcing contracts tend to be long term and form a close relationship between both parties.

There are many reasons why an organisation may outsource certain aspects of business operations, these include.

- Cost reductions in terms of operations – savings will be made on in-house labour as the outsourced task will no longer be required internally.
- Gain knowledge and expertise from specialists – as the service provider will be an expert in the field of warehousing and distribution, Toon Air will benefit from this expertise and in-depth knowledge of that sector.
- Focus on in-house specialities – when the outsourcing contract has been implemented, this will free up resource to allow increased focus on core elements of Toon Airs business. As the sector has had new operators enter the market, having resource available may allow Toon Air to focus on other areas to help gain a market leading edge again. Managing processes internally can lead to missing out of growth opportunities (Stanley, 2012)
- Improve current service – spares storage and distribution are not effective at Toon Air currently. Outsourcing this service will put the responsibility on an external party and should improve the availability and speed of distribution being operated by a specialist.
- Reduced inventory – as the service will be operated by an external organisation, Toon Air will not need to outlay for the cost of the spares, this will be managed by the outsourced company, reducing the outlay of capital funds.
- Reduced headcount – the personnel currently controlling the spares storage and distribution will no longer be required in that role, they could be utilised in another part of the business if they have the correct skillset, or they could be dismissed to save labour costs.
- Flexibility and scalability – using a specialist external party for storage and distribution of spares allows for greater flexibility in terms of quantity and speed of delivery to end users. This helps when more spares than anticipated are required, the specialist knowledge within the external company can assist with expedition of additional spares in a short timeframe.

However, there are also many negatives that can cause outsourcing services to be a disadvantage.

- Loss of access to suppliers expertise – the external outsourcing organisation takes the procurement of spare parts burden away from Toon Air, this then creates a problem whereby if Toon Air required technical information on spare parts or any other support not directly associated with supply of materials, the close relationship with the supplier and their expert knowledge may diminish over time, removing support that may have been available previously through direct engagement and relationship building.
- Loss of in-house knowledge – as the inhouse service is removed, the staff that have the knowledge of spares storage and distribution will ultimately be surplus to requirement and their employment ended. This may become a problem if the outsourcing contract was to be unsuccessful and these services become an inhouse service again, the personnel that were knowledgeable in this field will no longer be available and costs will be incurred through recruitment and training of new staff.
- Loss of control – although Toon Air will be providing direction of the service that is required, the external service provider will not be based on site at Toon Air, this creates a situation that may be difficult to control as the support personnel will be remote and communication may be difficult (Patel, 2017).
- Supply consistency – the relationship that Toon Air has built with its suppliers has been successful for continued operation this far. They will now be reliant on the contacts of the external organisation to provide spares continually and with the required quality standards. This removes the partnership between Toon Air and the suppliers direct, this puts more reliance on the performance of the outsourced organisation. It is imperative that Toon Air and the outsource company have a good working relationship to ensure continuity of quality assured spares (Vachette, et al., 2016).
- Future pricing – the cost negotiations for spares will be reliant on the external organisation. Toon Air must use specific parts as the aviation industry is heavily regulated. If Toon Air do not have a good relationship with the outsourced company, or the outsourced company do not deal well with the supplier, spares costs could increase disproportionately, increasing Toon Airs maintenance costs considerably. There would have to be an agreed markup attached to the material supplied from the source.
- Commercial confidentiality – Toon Air are relying on the ethical values of the external organisation and its moral obligation to conduct ethical business practices. The external organisation will have access to some of Toon Airs sensitive commercial information. If they do not trade ethically, this information could be leaked to a Toon Air competitor and cause commercial damage. Toon Air must ensure that there are penalty clauses if any unethical practices are conducted.

Specific attention areas

Before entering an outsourcing contract, there are many elements for Toon Air to consider.

Toon Air would need to undertake a review of the costs associated with appointing an external organisation to undertake the management of warehousing and shipping of spares, compared to keeping this process in house and offering training and development to help streamline the process so that spares are always available and delivered to the end users on time.

Toon Air also need to consider the most suitable vendor to partner with. The potential vendors should be evaluated and selected based on previous experience, level of expertise offered, good reputation and track record, good ethical standing and level of services offered with no conflicts of interest. The external organisation must also have a cultural fit with Toon Air.

The terms of the service must be laid out in the contract so that there is no ambiguity of the level of service offered. There must be detail on the performance requirement, scope of work/ service, pricing of spare parts to Toon Air in relation to procurement costs to the outsource company, a dispute resolution process, data protection of Toon Air sensitive data, NDA, dedicated contract contact, contract duration, warranty and liability information and performance review methods. These elements are of key importance when setting up the outsourcing contract.

I feel that there will be great benefits to Toon Air by outsourcing the management of spare parts. It is critical that the relationship with the supplier consists of trust, compatibility, and closeness. They must have similar values, understand each other's business and be open and honest. The outsource contract needs a close relationship over a long period of time. There must be an understanding of the reliance that Toon Air are placing on the supplier, this is a critical element of the business that needs to be managed efficiently and effectively.

The images below show the key areas of outsourcing that are advantageous and the areas that are difficult and may cause disadvantages.

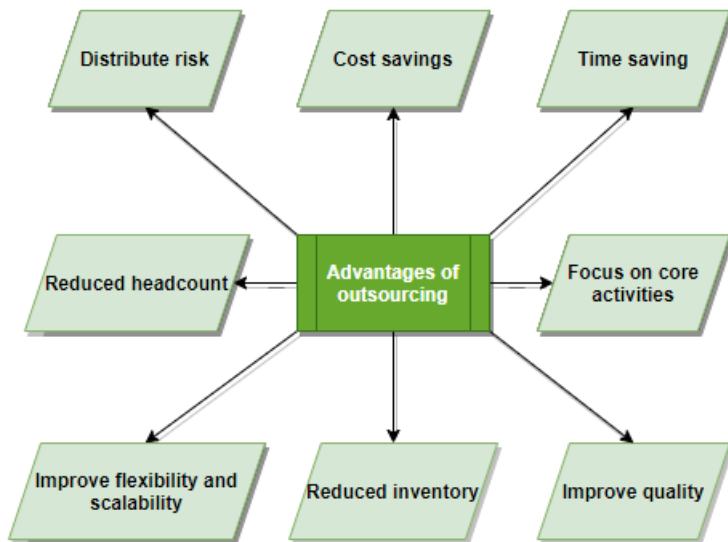


Figure 3 - Advantages of outsourcing

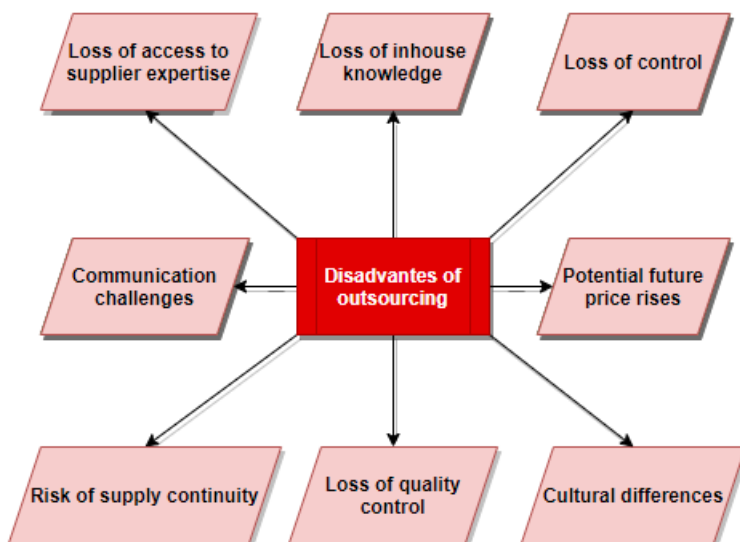


Figure 4 - Disadvantages of outsourcing

Question 3

“Evaluate what performance measures would need to be implemented for the outsourcing of the parts warehouse.”

Outsourcing is becoming an ever more popular method of achieving performance improvements. The results of these endeavours, however, have achieved somewhat mixed success. Some organisations have achieved the desired outcomes, whereas some have not (MCIVOR, et al., 2010)

Firstly, as well as performance related measurement, the relationship between the supplier and Toon Air must be evaluated. The strength of the relationship will be guided by the objectives set out in the outsourcing process. Monitoring the strength of a close collaborative relationship will involve analysing joint problem solving, high levels of information exchange and management commitment from the supplier as well as the client. Some of the factors in the relationship between client and supplier are detailed below (MCIVOR, et al., 2010)

- Economic factors
 - Financial value of outsourcing contract.
 - Strategic importance of client to the supplier.
 - Exit costs to leave the contract.
- Characteristics of relationship
 - Types of information exchanged.
 - Willingness to share information.
 - Frequency of communication.
 - Quantity of contacts and their levels.
 - Duration of the relationship.
- Co-operation of client and supplier
 - Business process improvements and innovation integration.
 - Willingness to integrate systems.
 - Integration of management.
- Distances between client and supplier
 - Socially.
 - Culturally.
 - Technological.
 - Time.
 - Geographical.

Outsourcing a service should add value to the process and alleviate the burden of this activity on the client. To ensure that is happening correctly and effectively, regular performance reviews must be implemented. The performance needs to be measured against a set of metrics.

Customer service levels is one key performance indicator (KPI), this is the ability of the outsource team to deliver the service to the end user (EB Call Center, 2021). In the case of Toon Air, this will be the availability of spares and the time taken to receive the spares at the required destination. The time and availability should be set in the contract terms and the performance of this can be measured according to the spares being delivered at the correct time. If this does not happen, there needs to be a resolution service, this also needs to be measured for time taken for the issue to be resolved.

The quality of the service provided should also be evaluated. For Toon Air, outsourced staff would required an in depth knowledge of aircraft spares and servicing, this can be measured by the knowledge received when Toon Air engineers require specific parts, outsourced staff would need to know the options and availability of the discussed equipment. Staff turnover and availability shall also be a factor, relationships will be built and it is important that consistency is present to build trust and familiarity.

Managing costs of procured spares, shipping and the labour cost associated with arranging these elements must be managed. Set rates for specific spares and the associated labour time must be agreed when creating the contract. Outsourcing is an investment and the ROI must be calculated to ensure the contract financially sound.

I feel that the performance monitoring and review is a fundamental element of managing the outsourcing contract. The elements listed above should be subject to a monthly meeting between both parties to ensure that performance and expectations are being achieved from the client and the supplier. Both Toon Air and the supplier must jointly review both parties' performance to achieve the joint goals set out. Good communication is critical and any issues must be fed back in order to be acted on quickly. Maintaining the working relationship is extremely important and any troubles must be voiced and resolved promptly. It is important to remember that performance monitoring is a two-way exercise, Toon Air must provide sufficient information to ensure the supplier can operate as required, likewise, the supplier must operate as set out in the contract to ensure performance can be monitored.

The image below shows the steps to building a good working relationship regarding outsourcing contracts.

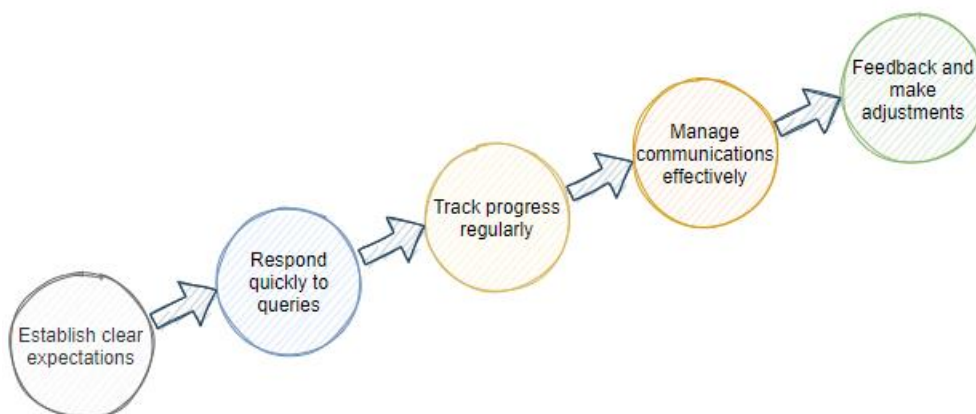


Figure 5 - Steps to help working relationships.

Recommendations

Having reviewed and evaluated the available data on Toon Air and its management of spares and distribution, I feel that outsourcing this element of the business will be beneficial for Toon Air. As the data dictates, the current system leaves engineers without spare parts and causes considerable delays. If this service was outsourced to a specialist supplier, availability of spares and delivery of those spares within an agreed time frame would be a KPI for them, this would ensure that the level of service is to the required standard. Outsourcing this non-core activity would also free up personnel within Toon Air to focus on other, core tasks of the business and add value to those elements. The outsourcing supplier would have expert knowledge in warehousing and distribution, but also knowledge of aircraft and aviation, having this knowledge would alleviate the burden on engineers to speak directly with suppliers. This formal process would also improve the terms of purchase with suppliers, as the outsourcing supplier would be experts in this field, as it is a core aspect of their business. Improving this element would likely reduce the repair and maintenance time due to reducing the delays through material availability and allow better utilisation of available aircraft.

The communication between Toon Air suppliers, designers and warehouse managers also needs to be improved. The high level of obsolete inventory is costing Toon Air space in storage as well as cash outlay for spares that will not be required. The parties involved should organise a strategy that plans for a changeover stage where, from a certain point, only the upgraded spares are purchased and the obsolete parts are ceased from the order catalogue and, are gradually phased out. This will reduce excess inventory and improve cash flow and storage space.

De-centralising the warehouse will also give greater flexibility in the delivery times to destination airports. Hubs could be placed at the destination airports to allow engineers quick access to spare parts, the hubs could then be restocked when the existing stock approaches its reorder level. This will remove the singular storage site and reduce the chance of stock outs. Having stock at multiple sites will reduce lead time and minimise the chance of downtime, therefore improving the utilisation of aircraft. The space gained in the warehouse from spreading spares across multiple areas, could be used for storing safety stock to further mitigate stock outs.

I feel that implementing the changes stated above will greatly improve Toon Air's material management process, and, in turn, ensure that they reduce operating costs to become a market leader within the UK small airline industry.

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