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AIRCRAFT PARTS PLANNING TAMING THE CHAOS

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EXECUTIVE SUMMARY

01 INTRODUCTION

Even as input costs continue to rise, globally, airlines are under constant pressure to maximize profits and reduce costs. To reduce the locking up of working capital, airlines adopt several cost cutting measures right from aircraft induction to phase out and stringent control of inventory. Material Planners play a key role in effecting this objective.

Every on-time take-off of an aircraft is the result of various airline functions such as Operations, Ground Handling, Maintenance, Materials etc. working seamlessly together. A closer look at the materials' function reveals the complexity involved with meeting the service levels for maintenance. At the same time, they also face the challenge of being answerable to the top management on the inventory cost.

Without Material Planners to ensure the availability of the right part, in the right quantity, at the right place, in the right condition, with the right quality and with the right certification, no single solution or single approach will be able to meet the objective. The following key areas play a vital role in achieving the desired objective of meeting the service levels:

- Part Codification & Alternate
- Part Classification
- Initial Provisioning /RSPL Data
- Inventory Control Systems
- Spares Demand Management
- Inventory Analysis
- Float & Scrap Management





Source: Content available over WEB Fig. 1

02 AIRCRAFT SPARES – UNIQUE CHALLENGES

Spare Parts Management plays a vital role in any asset intensive organization, like Refineries, Fertilizers, Power plants, Airlines etc. One of the unique challenges of airline operations is that every key asset such as Aircrafts, Crew, Inventory, Spares etc. is on the move. The biggest question in Airlines is not only how many spares to maintain but also where to maintain them.

IATA : AIRLINES MAINTENANCE COST **03** EXECUTIVE SUMMARY (ALL MCTF AIRLINES

PREPORTING DATA BETWEEN FY 2007-2010

Typically, airlines spend 20 to 25 % on the Direct Maintenance cost as the cost of the spare parts used in Maintenance. Owing to the volatility of prices of aviation parts, vendors change the prices regularly and these changes are often decided based on the lead time demanded and the proprietary nature of the part. The escalating prices as the average inventory value per aircraft is on the rise. Airline Material Planners are under pressure to reduce inventory to cut costs, but at the same time to ensure that aircrafts are not grounded due to the non-availability of spare parts, thereby losing the revenue.

04 MATERIAL PLANNING - FOCUS AREAS

The adage, "Every day is not the same day," is especially apt for Material Planners. They have the objective of ensuring the availability of right part number, in the right quantity, at the right place and a focus on a single area will not yield the desired results. A holistic approach to key focus areas, right from managing the master set up to various other key areas in planning and controlling, has resulted in overall efficiency in terms of meeting service levels and cost control.



Fig. 2



Fig. 3



Fig. 4

05 PART CODIFICATION & ALTERNATE MAPPING

Although a basic step, any error at this point would lead to considerable inefficiency in the downstream process. Typically, organizations follow either the Manufacturer Part Number or an internal company-assigned Part Number to track and manage the spares. Tracking with the Manufacturer Part Number has considerable benefits, especially during ordering of the Part, sending items on repair, and referring to the AMM /CMM /MPD or IPC.

Few Part Numbers have a different nomenclature and are completely different when theyare supplied from two different manufacturers. In such cases, a Part Record has to be created along with the Manufacturer Code. This will help in downstream planning and maintenance functions and also help specify the intended part number and nomenclature.

Another important aspect while setting up the Part Number is mapping the relevant alternate parts and interchangeable (INC) relationship as specified in IPC /RSPL.

- 1 One Way Interchangeable
- 2 Two way interchangeable
- 3 Not interchangeable
- 4 Interchangeable as a complete set only
- 5 Conditionally interchangeable
- 6 Parts re-identification.

Setting up of interchangeable mapping will automate the process of picking the Alternate when the maintenance requested Part Number is not available, thereby reducing considerable time in spares issue.

06 PART CLASSIFICATION

Agencies like OEM, Suppliers, Customs, IATA Etc. classify the part for specific purposes. Internally, the organization further classifies the parts for financial and operational purposes. Managing these various classifications help the various functions to operate seamlessly, besides integrating and aiding in automation and reporting.

Example:

- ESS-No Go item should be prioritized in Internal Repair and expedited in External Repair
- Periodic automatic expiry report for shelf life controlled parts
- Enforcing fixed location in warehouse to keep Electrostatic and Hazmat items

Classification Type	Classification	Usage In Material Planning	
Spare Parts Class (SPC)	1 - Expendable 2 - Rotable 6 - Repairable	Ascertaining financial treatment to capitalize or to treat as inventory. Setting up the scrap policies	
Essentiality Code (ESS)	1 - No-Go 2 - Go-If 6 - Go	 Ascertaining the quantity of spares to be positioned at the line stations Entering into Pool Agreements through IATP or bilaterally 	
Restrictive Operations	• ETOPS • RVSM • CARGO	 Ascertaining the quantity of spares to be positioned at the line stations supporing restrictive operations 	
Regulatory Control	HAZMAT Electrostatic Customs Bonded	 Ensuring regulatory compliance while receiving, transporting, moving, handling, stocking and exporting 	
Physical Nature	Shelf Life	Monitoring and disposing off the expired items Monitoring and recertifyingthe shell life extendable items	
Replacement Type	• SRU LRU	Ascertaining the spares to be positioned at the Line Stations	









07 RSPL / IP DATA

Earlier, it was common to estimate the spares to be procured for the entire life of the aircraft, along with the aircraft itself, with the cost of spares ranging from 15-20% of the aircraft cost. However, airlines now provide and procure in phases, keeping in mind the need for maintenance and the experience of operators in actual usage.

Key information available in the RSPL/IP has to be digitalized and moved to the IT-MRO system for seamless use. For example, comparison of Current Scrap Rate, Current Removal Rate, Current Mean time between unscheduled removals, Current Float etc. can be compared with the respective data recommended and corresponding Root Cause Analysis can be done if there is a variation.

RSPL or IP information provided by the OEM during induction or fleet expansion can be reckoned anytime for comparing the current inventory levels with the recommended value and to analyze the reasons for the variation.



Fig. 8

Key information available in the RSPL/IP has to be digitalized and moved to the IT-MRO system for seamless use.



Fig. 9

08 INVENTORY CONTROL SYSTEMS

One of the key aspects of Airline Spare-Parts Management is location sensitive availability of spares. If the Aircraft at Line needs an item at Station-A and it is available at Station-B which is 30miles away, it will be an AOG if the transit time for the aircraft is 20 Minutes. The quantity has to be distributed across the locations, for the parts of classification LRU and No-Go. The determination of the quantity distribution to the Line Stations has to be evolved after balancing the existing float quantity with the desired service levels.

Inventory control systems like Re-Order Point and Min-Max have to be set at each location and for each part, the replenishment lead time has to be taken into account and monitored regularly. When the items go below the reorder or minimum levels, the IT-MRO system should automatically trigger the replenishment without any manual intervention. The replenishment action should preferably beset as auto transfer from the base, which leads the centralized operations and feeds information to the line. This set up will ensure the base stores get an automatic alert for replenishment and the item is dispatched immediately to the line. Periodic review and adjustment of Re-order / Min points is necessary due to the dynamic nature of consumption and TAT.

However the movement of the Line Station should be brought to the AOG desk or central planner before the transfer.

09 SPARES DEMAND MANAGEMENT

It's always a balancing act to meet the current and forecasted demand with the on hand and expected supplies. Forecasted work scope and grounding schedule of Aircrafts / Engines/ Components has to be planned for the availability of parts required to carry out the required work scope. If it is not available, then possible ways to meet the demand within the given time should be worked out.

Demands arising out of non-routine defects during maintenance are inevitable and planners have to be highly responsive to meet these unforeseen demands to avoid the work stoppage or AOG. A complete visibility of spares in the warehouse, in shop repair, in transit between bases and from supplier shipments, with external repair agencies, in customs clearance, under receipt inspections etc. will help the planner expedite and meet the demand. The possibility of exchange can be explored with the repair vendor to meet the demand on time.

If the demand is for a short period, for example, if the aircraft needs the item at the outstation where it doesn't have stock, the possibility of pool access through IATP membership or taking the item on loan */*borrow can be worked out.

Material Planners should forecast the planned demands for varying time scales. The forecasting can be as low as 6 hrs to 24 hrs for line maintenance and can span anywhere between 2 months to 24 months for the base maintenance and varied time scales for engine and component maintenance forecasted demands. For the forecasted demand, simulated balancing of required quantity and projected receipts and on hand quantity will help the planner find out the actual shortage items and take necessary steps to balance.



10 INVENTORY ANALYSIS

It should be ensured that proper inventory control systems meet the desired service levels and at the same time, not lock the cost with excess inventory. With thousands of part numbers # to be managed, it is helpful to classify the items for selective and better control.

ABC Analysis : Works on the consumption value for the given period of the time that the parts are accounted for. (For example, say 70% of the costs are classified as A, 20% of the costs are classified as B and 10% of the costs are classified as C. This analysis helps in focusing the type A parts more in a periodic cycle count, which increases the inventory accuracy and also helps in tightening the cost control .Carrying C class items add little to inventory value; due to this, items safety stock can be set higher to avoid stock-outs and bulk purchasing contacts can be established with the vendor for volume discounts.

FSN Analysis: Works on how fast the item is moving within the organization. For example if fast moving items get transacted once in a month, slow moving items once in 6 months and non- moving items once a year, this analysis would help organizations to enter the bulk purchase for fast moving items which will lead to cost savings. Non-moving items can be periodically reviewed and disposed off, which will clear the inventory carrying cost and create space for other items. This analysis also helps in arranging the stocking layout to reduce handling.

Organizations do follow other types of analysis like VED (Vital, Essential, Desirable), XYZ (Based on the items unit cost), with the objective of selective grouping of the item and managing for maximum benefits. Performing the multiclass analysis will significantly add value to the planners for determining the probable next steps.

	А	В	С
F	 Tightest control in	 Reduced frequency	 Low frequency in cycle
	issue and returns	in cycle counting	counting
	 High frequency in	 Expedite and reduce	 Safety stock can be
	cycle counting	TAT	significantly increased
	 Expedite and	 Safety stock can be	 Bulk purchase contracts
	reduce TAT	marginally increased	can beentered
	 Review forecast and every demand 		
	 Accurate safety stock up 		
S	 Tightest control in	 Reduced frequency	 Low frequency in cycle
	issue and returns	in cycle counting	counting
	 Manage through pool access or borrow 	 Manage through centralised stocking and feed 	 Evaluate excess quantity and dispose off
N	 Expedite disposal	 Expedite disposal for	 Expedite disposal for
	for releasing the	releasing the locked	releasing the locked up
	locked up cost	up cost and space	space

11 FLOAT AND SCRAP MANAGEMENT

With Aircraft Spares Inventory running into millions of dollars, the decision to scrap an item should be properly managed.

Decision to scrap the Item has to be taken with due consideration, whether DER procedures exits for the item or not, so that it can be refurbished economically and any sub components can be cannibalized for future use. If the item is deemed as scrap, necessary approvals have to be sought before the item is defaced and moved to a scrap yard. Replenishment of the scrapped items can be timed immediately after the scrappage or when the demand rises for the item, based on multiple factors like Cash Outflow Control, Vendor TAT, Essentiality and Float Requirement of the item. If the No-Go item is scrapped and vendor TAT is high, the provisioning has to be triggered immediately.

The decision to replenish the scrapped item through provisioning has to be proceeded by the analysis of the current float situation and comparing with the recommended float levels. If the current float is greater than the recommended float, then the replenishment can be put on hold to ease the cash flow. However for a No-Go item, if the current float is lesser then the calculated float and TAT is high, the planner has to arrange temporarily for interim requirement and initiate the replenishment immediately.

With multiple parts getting scrapped every day across bases, performing analysis and effecting the part movement and initiating provisioning, need to be automated without much manual intervention. This can be possible only with the proper classification of the part and provision to set scrap rules(i.e.)whether it can be scrapped in Line or Shop. Once it is scrapped, the decisions on what should be the replenishment action and when it should be triggered, should be taken. Suggested mapping for better cost control are as shown in the below mentioned table:

Spare Part Class	Scrap Allowed At	Vendor TAT	Essentiality Code	Unit Cost	Repair Scheme / DER
SPC-1	Line , Shop and Hangar	Less	ESS-3	Less	Not Available
SPC-2	Shop Only	Less or More	ESS-1,2, or 3	More	Available
SPC-6	Shop Only	Less or More	ESS-1,2, or 3	More	Available

Fig. 12

12 CONCLUSION

Airline Material Planners across the world have the responsibility of ensuring that, aircrafts are departing on time. Be it Line or Hangar, they are equally responsible for the management to achieve this with the constraints on spending on inventory .Material Planners can never be replaced by any software or systems, but holistic IT-MRO systems with high flexibility in managing the varied dimensions and seamless integration between various functions, will enable them to tame the chaos!

Ramco Aviation Suite of M&E solution is supporting Materials Planners worldwide with integrated material planning modules for parts – RSPL Master Data, Float Management, Scrap Management, Material Planning Reports, and Stock Analysis, which help in increasing the service levels for the spare parts with optimized inventory cost.



13 GLOSSARY

IATA - International Air Transport Association	ETOPS - Extended Twin Engine Operations		
MCTF - Maintenance cost Task Force	RVSM - Reduced Vertical Separation Minimum		
RSPL - Recommended Spare Parts List	HAZMAT - Hazardous Material		
IP - Initial Provisioning	SRU - Shop Replacement Unit		
AMM - Aircraft Maintenance Manual	LRU - Line Replacement Unit		
CMM - Component Maintenance Manual	AOG - Aircraft On Ground		
INC - Interchangeable	DER - Designated Engineering Repair		
OEM - Original Equipment Manufacturer	IATP - International Airlines Technical Pool		
MRO - Maintenance Repair & Overhaul	TAT - Turnaround Time		
SB - Service Bulletin	MTBUR - Mean time between Unscheduled removal		
MPD - Maintenance Planning Document			

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