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Impact of Covid-19 on material management practices

The challenges for airline operators and MROs in being prepared for the time after.

When Covid-19 hit a prospering industry, the effects were substantial. Significant capacity adjustments led to a wave of unprecedented challenges for aircraft operators. The impact affected all relevant divisions of operators and premature lease returns leaving parked aircraft on the agenda.

This article provides an overview of the most common problems in material management for operators and MROs with recommendations on how to act in preparation for post-Covid19.

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Looking back on the past 30 years, material management was - and still is - commonly criticized. According to operations, material provisioning was poor which justified why the required material was not available at the right place and time. From a finance point of view, material cost was too high and needed to be reduced. For this reason, material departments were neglected which is still the case in many airlines and MROs today.

During Covid-19 the pressure on material management reduced as a result of fewer material requests and the possibility of borrowing spares from parked aircraft. Nevertheless, the time to get prepared for the post-Covid-19 period has arrived.

Now it is the time to act

Advanced software solutions, big data and digitalization may give advanced opportunities to predict material requirements. However, these systems usually do not correctly handle a demand situation such as during a pandemic and the related material consumption. Using historical data, such systems may miscalculate the real demand. Therefore, it is crucial that material planning experts understand how to handle the systematic calculation to avoid shortcomings in the post-pandemic period. Relying on system forecasts only may become a dangerous undertaking in the near future.

How near the future will be is a question of vaccination, virus mutations and human behavior and cannot be answered precisely. But Covid-19 forecasts support that it might be soon.

Who in material management is affected?

The typical fields of activity in a material management include:

- Parts Planning and Provisioning
- Parts Purchasing
- Parts Receiving and Storage
- Parts Recording
- Parts Issue and Parts Return
- Parts Repair
- Parts Replenishment
- Parts Control
- Parts Pool
- Handling of parts in case of Aircraft Leasing

The majority of these departments in material management were barely affected by the Covid-19 pandemic, except for parts planning and provisioning. All material forecast figures are calculated based on parameters defined by material planners. Hence, the material planner needs to understand the systematic processing of data and act in case of pandemic-influenced false processing.

Our observation is that the typical material planning function does not exist in many companies. The title 'Material Planner' may be registered in the staff list but the function is usually limited to 'performing what the system says', or 'responding to actual maintenance requests'. The blind trust in computer systems, combined with material planning which never had to perform detailed calculations of spares, may become a problem in material provisioning. The fundamental question will be: is material planning aware of the revised tasks and are the planning staff able to fulfill the additional requirements?

To answer this question, the tasks for material planning are outlined as follows:

List of tasks for material planning

- Methodical development of material management
- Aircraft parts classification
- Tracking & computation of parts reliability
- Application of spare parts recommendation list
- Forecast of expected parts removal
- Determination of Mean Grounded Quantities (MGQ)
- Application of Poisson Law distribution
- Forecast of total spares requirement
- Cost saving potentials
- Definition of surplus

Is the material planning staff in your company aware of those techniques?

Partially forgotten skills and abilities

Considering parts planning as an essential field of material management for the determination of parts to be provisioned, it is worth mentioning, that the methods applied for the calculation of spares requirements were developed in the early 70's at the time of first-generation jet aircraft.

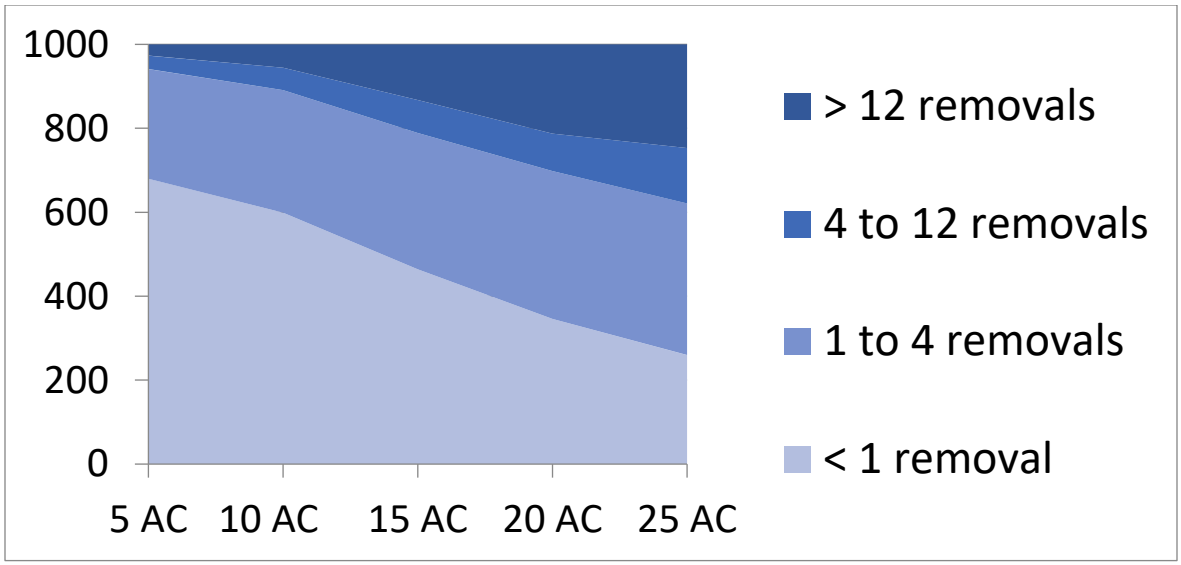
Prior to this time, the determination of spares requirements was based on the individual knowledge of employees. This determination was based on the principle to declare an aircraft part as a spare part if at least the usage of one unit per year could be expected. Due to the circumstances observed at that time it should be noted, that the application of this principle assured the provisioning of 80% to 90% of aircraft parts considering the fleet sizes at that time. That means, that 10% to 20% of spares were not in stock for routine replacement but had to be provided upon request. However, it is obvious that the parts reliability of new generation aircraft is significantly higher compared to the old generation. This leads to the fact, that for a fleet of 10 aircraft about 60% of aircraft parts show a usage of less than one unit per year, meaning that 40% only are considered as spare parts if the above principle applies.

In connection with the delivery of the aircraft, a recommended spare parts list (RSPL) is provided by the manufacturer which includes, among other material data, the mean time between removal (MTBR), the spare parts classification/category (SPC), the catalogue list price, the recommended spares quantity and a safety stock to cover the erratic nature of parts removals. Profit-oriented manufacturers consider parts as spares-in-stock which could also be provided upon request to avoid initial investment. To understand and recalculate spare recommendation parts, the responsible material planner has to be familiar with these calculation techniques.

The pandemic impact

During the pandemic, an airline with about ten aircraft would only have had a handful of its fleet flying. Therefore, the usage of parts is equivalently reduced by 50% or more. In reverse, there were significantly more parts in stock than required. Consequently, the advanced IT-systems adjusted the expected requests if not harmonized by the responsible planner. Consequently, the same principle applies for the material planning department. The staff needs to have the skills and abilities to consider and recalculate the pandemic-driven demand change to feed the IT-system accordingly or perform a manual recalculation and initiate procurement if required.

Figure 1: Illustrates the total number of line removable spare parts for a current generation single aisle aircraft (i.e. B737-800 or A320 family) and their average usage in relation to the fleet size.



Comments for Figure 1: The diagram shows 1000-line replaceable components. The real figures are on average slightly higher and vary from model and equipment. To make it comparable, figures are rounded to 1000.

For an airline with a fleet of 25 aircraft of the same model about 250 components will be replaced in a one-year period, for an airline with five aircraft this number drops to 27 (average).

The main planning tool for more detailed spares calculation

Company objectives often postulate a required service level of 95% or more, but what should a material planner do to reach this service level? The answer is in the Poisson Law application.

In fact, quite often IT-systems use the Poisson Law distribution (or similar) for their calculation of the required service levels. The Poisson distribution is applied for the Mean Grounded Quantities (MGQ) as average value to determine the additional spares quantity needed to cover the frequency of parts removal.

The MGQ is calculated by the following formula:
MGQ = Removal per year multiplied with Turn Around Time (TAT) divided by 360

In the following example it is evident how volatile the service level reacts by adapting the number of spares.

Table 1: Service level in relation to stock quantity and MGQ

	MGQ	MGQ	MGQ	MGQ	MGQ	MGQ	MGQ
Spares	**0,10**	**0,20**	**0,50**	**1,0**	**2,0**	**5,0**	**10,0**
0	90,48	81,87	60,65	36,79	13,53	0,067	0,005
1	99,53	98,24	90,98	73,58	40,63	4,04	2,800
2	99,98	99,88	98,54	91,97	67,77	12,46	1,04
3	100	99,99	99,82	98,10	85,71	26,50	2,93
4	-	100	99,98	99,63	94,73	44,05	6,71
5			100	99,34	98,34	61,60	13,02
6				99,99	9954	76,22	22,03
7				100	99,89	86,66	33,29
8					99,98	93,19	45,80
9					100	96,82	58,31
10						98,73	66,21
11						99,45	72,36
12						99,80	86,46
13						99,93	91,65
14						99,98	95,23
15						100	97,50
16							98,58

Comments for Table 1: E.g. one spare in stock and due to removals on average one part is permanently unserviceable under repair (MGQ = 1) This results in a service level of 73.58%. Increasing the spare quantity to two, the service level will increase to 91.97%

For low-usage parts with one or less removals per year the MGQ may be 0.1, having one spare in stock the service level will be 99.53

Concluding Remarks

To prepare for the post-pandemic period, various countermeasures need to be applied in due time to avoid shortages or an overstocking situation. The question about which detailed

activities need to be performed has no general answer because individual parameters have to be considered. However, it is important that the responsible material planning staff is capable and trained to handle the individual challenges and extraordinary situation.

While the above problems are certainly not applicable to every operator or MRO to the same extent the relevant Material Manager would need to develop a tailored action plan for its department as it seeks to navigate the crisis and emerge stronger, leaner and smarter.

To learn more and discuss how your organization could benefit from Lufthansa Consulting's expertise on Crisis Recovery, please get in touch at ALcrisis-solutions@LHConsulting.com. ***Together, we can make it through to better days.***

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