Big data in aircraft maintenance

It’s not the size of a database that matters, explains Sander de Bree, Managing Director at the ExSyn Aviation Company; it’s using it to transform the way things are done.
Big data is a term that we hear around us more and more often these days; but, even though we hear the term frequently used, do we really understand what it means? What is big data; what underlying principles are being impacted by it; how can we utilize big data and its underlying principles in the aircraft maintenance industry; and, ultimately, how can we benefit from it? In this article I will try to shed some light on these questions and offer a few answers.

Big data or ‘information of extreme size, diversity and complexity’ (a definition used by Gartner INC, one of the world leading institutes on IT), revolves around the complexity (a definition used by Gartner INC, one of the world leading institutes on IT), revolves around the organization's ability to analyze and interpret the huge volume of data at its disposal. Having this capability starts with having adequate talent and tools in an organization to perform such analyses. In addition, an organization needs to have the governance structure to allow proper data interpretation. Considerations such as data quality and available funds to support the infrastructure come into play here. A definition for ‘adequate talent’ has to be clarified here as well; talent does not revolve around having an army of ‘data scientists’ in an organization providing endless reports to management. ‘Talent revolves around having people in key-places in the organization who are able to analyze and interpret data once it is provided to them.

This is where, in years to come, we will notice the shift, as collecting and providing data to management becomes increasingly automated and the emphasis starts to move from collection to interpretation (e.g. what does this particular graph tell me?). As the changed emphasis will drive the analyses and interpretation of the data, however it is presented we need to distinguish three items here:

1. Predictive analyses; using available information to identify expected future trends or outcomes;
2. Behavioral analyses; using available information to create models to drive programs such as cost reductions, product changes, innovation, customer satisfaction or quality improvements;
3. Real-time analyses; using available information to drive decision making in the here-and-now.

Analyzing and interpreting that data, however, it is presented, and allowing the organization to be driven by data (information), and access it in a timely manner (it doesn’t make sense to have access to last year’s data only two years after the event), have the computing power to retain it, have the resources to interpret and analyze it, and to allow the organization to be driven by data...”

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DECISION MAKING AND EXPLOITATION

Of course, none of the above matters if we don't properly apply the analysis and interpretation of the information available to us to drive strategic decision making and exploit the data for our benefit. This is best illustrated by an example I have seen being used by others on different occasions: 'Whiskey and ice is bad for your liver; Vodka and ice can cause short term memory loss; Pepsi and ice damages your teeth. Therefore ice is bad for you and should be henceforth banned from your drinks!'

Hopefully we'll avoid making that mistake but, in that case, what can we do with these three principles of big data in our aircraft maintenance environments and how can we put it to good use?

Before we consider the answer to this question, let's first of all get rid of the obvious response. Sure, we could gain operational efficiency and reduce costs if airlines and maintenance companies were to use data more effectively; but this is a narrow-minded, 'stuck-in-the-here-and-now' view of things. And it completely misses the fact that big data in aircraft maintenance has the potential to fundamentally change the whole way the industry works. In order to see that fundamental change, we need to look beyond the borders of our own airline or maintenance company...

knows that a flight control computer is required, with an engineer to replace it, for flight EX-1234 at Amsterdam airport on its estimated time of arrival.

Let us now suppose that the platform also has access to the airline's parts inventory to determine whether a spare flight control computer is available, where it is located and the estimated transit time to Amsterdam to get this part there. Finally let's take it one step further, and assume it also has access to the inventories of all other parts suppliers, other airlines and MROs. This now enables the system to check global availability of the flight control computer, the price and how soon it can be delivered to Amsterdam-Schiphol. In short, such a capability would be able to completely eliminate the buying decision for airlines based on lead-time to delivery, quality and costs. This example assumes an unscheduled maintenance situation; but just imagine the impact such a capability could have on all the scheduled purchasing that takes place in the industry (it is probably safe to say that it would account for around 70% of total purchases in the industry).

Now let's look at the engineer that we need in order to replace the flight control computer. The same principle applies here: the system would be able to look into staff availability within the airline's rostering and determine whether a suitable engineer can be made available at Amsterdam on the ETA of flight EX-1234 and what it would cost to get him there, if he is not already at the airport. Additionally, the system would be able to source with other maintenance providers to see if they have the capacity to provide a proper licensed engineer who can replace the flight control computer, and list costs, quality and performance. Thus, in this case also, the planning cycle would be fully automated. Again, this is an unscheduled scenario; just imagine the possibilities for scheduled maintenance. Hopefully by now you realize that, with the correct application of big data, we would have eliminated the human factor all the way up until the moment the actual flight control computer needs to be physically replaced on the aircraft.

Elimination of most human involvement until the moment of actual maintenance being carried out, enables numerous efficiency gains and process streamlining: production of spare parts being based on actual need rather than commercial drive, full accuracy in aircraft record keeping, provisioning of maintenance capabilities based on actual need rather than competition, optimal use of tools and equipment at airports, proper aircraft lifecycle planning to reduce environmental impact, and many additional positive effects that you might identify for yourself. Obviously all these improvements would result in significantly lower maintenance costs and improved operational efficiency. However, foremost as an industry, it would allow us to eliminate a large portion of human error (either fatal or non-fatal) by reducing the actual human involvement in all maintenance related processes.