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The End of the Castle Building Era

The state of the MRO industry in the US

By Ray Valeika

The Old (today's) MRO Model

Over thousands of years people built castles to repel attacks from a variety of enemies and weapons. And until the invention of gunpowder they were very effective and we still marvel at them today for their massiveness and beauty. However the artisans who built them found themselves out of work with the invention of gunpowder. The artisans were no less skilled but their skill was no longer needed. Throughout history we see these dramatic changes where great skill and craftsmanship are superseded either by technology, the whim of the public or geopolitics. We have witnessed these changes many times and now we are witnessing them in one of the great skill professions of the United States- aircraft maintenance.

Most profound changes take some time to occur. Aviation however, because of its dynamism, creates change in a much shorter time frame. Paradoxically, change can be destructive to some but also change can create an opportunity for others. I believe New York Times columnist Tom Friedman in his book 'The World Is Flat' summarized it aptly, although not necessarily thinking about aircraft maintenance, when he said that "We're entering an era of creative destruction on steroids".

So let's review how aircraft maintenance evolved, devolved and will ultimately resolve as it enters this new era.

The era of the craftsman

The early aircraft maintainers were mostly dependent on their own intuitive skills and/or experience. Because of this, there evolved a true craftsmen mentality whereby skill and knowledge resided in the person and great dependence on individuals resulted. As aviation grew and became more complex and more analytical data was gathered, aeronautical science started to take shape, but most of it focused on design principles rather than maintenance principles. This furthered the flourishing of the maintainer's craftsman mentality. As aircraft started flying longer and over greater distances, the dependence on the unique knowledge and skill of the maintainer blossomed and became ever more critical because communication systems were inadequate and primitive by today's standards and all that was available were a mechanic and his knowledge, in many cases in far-off stations.

This evolved into a system where the airlines themselves had to create a baseline of skill and competence along the lines of the skill and competence of these individuals. So, they hired the best individuals, trained them, and built facilities uniquely suited to the airlines' peculiar requirements and needs. In addition, the aircraft in the early days were not as functional or flexible operationally as they are today, for example, domestic and international airlines had significantly different needs in how they maintained and operated their equipment. Thus from the beginning grew a system where each airline had to create total support for its aircraft

based on the maintenance programs, available skills, and facilities that they would uniquely need.

Through well into the 70's, airlines were, like their craftsman technicians, performing nearly all of their maintenance functions on a stand alone basis. This became entrenched and perpetuated by public perceptions of the mystique of aviation, by the labor groups, and the regulators.

Organized labor of course saw this as an opportunity, using the skill and safety umbrella, to create and perpetuate many non-skilled and non-safety job functions. Additionally, they created unnecessary redundancy by not allowing cross-training and inhibiting cross-functional skills. Thus a very inefficient system was created, and when any change was contemplated, it was vigorously protected by contracts and to some degree by the regulators. This continued unabated since management had little incentive to change the system. But even more insidious was the fact that the maintenance management's pay structure was indexed off the mechanics' pay. So, there was incentive not to change the system.

By the same token, a system of oversight mirroring what was being accomplished at the airlines was implemented by the regulators. In essence, the regulators were mandating industry "best practices". Work ownership rules and scope clauses evolved forcing operators to repair and maintain their own equipment based on fleet size. And going further, the regulators mandated that each airline could only use its own parts on its airplanes and that all airlines must maintain discrete inventories and operating specifications. This forced incredible redundancy on the system and, while it may have made sense early on, it currently has no relevance. Because of these regulatory requirements, contractual commitments, and lack of incentive on the part of management to change, airline maintenance status quo was not only preserved but also ingrained.

This cozy system was unchallenged until well into the 80's and post-deregulation. Consequently, a significant overcapacity of maintenance facilities and staff emerged. Almost all airlines duplicated what all the other airlines were doing. This then set the stage for today's battle of vainly trying to preserve the status quo versus the relentless move towards efficiency and cost cutting in light of the financial condition of the industry.

The emergence of new carriers and more reliable aircraft

There is no specific time or single issue that began challenging this business model, but clearly deregulation created an environment where "new" types of carriers appeared. These carriers did not have the luggage of the past and thus started with more or less a clean sheet as far as self-dependence was concerned. Consequently, they did not need to create the infrastructure that the existing carriers had and, at the same time, they did create a need for maintenance services that most of the established carriers did not require. Early on, many of these fledgling carriers used existing big airline facilities since they were not deemed to be a threat. This shortly migrated to a new trend of maintenance being provided and accomplished by entities other than airlines.

Another factor that precipitated the dissolution of the integrated airline MRO's was the introduction of the second and third generation jet aircraft that created unprecedented levels of reliability. This was especially true of the engines. The introduction of digital electronics is producing cost savings and reliability improvements on the same order as what we have seen in the development of information technology, i.e. Moore's law, whereby we see improvements double every few years. This reliability was further enhanced by well engineered maintenance programs which depend a lot more on analytics than on the pure experience of the maintainer. These aircraft and engine combinations quite simply needed less maintenance. Not only are the aircraft better designed, but they are also better maintained based on more precise maintenance programs that are more data driven. This has altered the state of the craftsman mentality by creating more dependence on systematic data driven processes; an approach that reduces the variability of experience driven processes. A great deal of today's labor strife is the result of resisting the inevitability of these fundamental changes.

The growth of the so-called low-cost carriers and concurrently the inability of the major airlines to control their costs especially that of labor and benefits further eroded their ability to compete and survive effectively. The major airlines being burdened by their build-in infrastructure cost and the incessant escalations of the labor contracts caused by pattern bargaining were unable to sustain themselves effectively and the golden goose started running out of eggs. . Fortunately for the low-cost carriers, they did not have to deal with the entire burden of the past and thus could begin with a much lower cost structure from the start.

Over the past few years this has created an adversarial airline employee model consisting of highly entrenched labor groups trying to preserve anachronistic work rules and management finding opportunities through bankruptcies and their poor financial state to alter many of the previous perceived inadequacies. The result in the US is that many and perhaps most of the airlines are actively pursuing disposal or significant reduction of in-house maintenance. All union and non-union legacy carriers, many now in bankruptcy, have slashed staffing, services, and facilities, creating a large surplus of mechanics. This is a classic case where labor, whose incentive is to create more jobs, and management, whose objective is to run a good business, have not found a common ground or framework for peaceful coexistence!

The cost and revenue dichotomy

In this environment of high fixed costs and overhead, the straw that is truly breaking the back of the legacy carriers is the proliferation of the internet and low cost carriers which makes it very difficult to control pricing. The old advantages of the in-house reservation systems have rapidly diminished, and the lack of pricing control is perhaps the final chapter in fostering the change of the traditional airline business model. A business cannot survive when cost of the product and the revenue it generates are independent variables.

This then forms the basis for today's airline business reality. The airline's response to this dilemma is to cut costs, and mostly the costs that are somewhat controllable are labor costs. To succeed in cost cutting, however, is exacting a huge toll on the social fiber of the employees and breaking down the long established infrastructure, especially in maintenance.

The fragile financial condition of airlines and the subsequent intense focus on cost reductions is driving a cataclysmic change in the maintenance business. Once this process reaches its inevitable conclusion there will be a new business model.

Over the past few years the legacy airlines have shrunk their in-house maintenance capabilities. While this has occurred the non airline MRO providers in the US have not fully grasped the opportunities being created to integrate maintenance and maintenance services. The MRO business today is very fragmented and runs on a job shop basis. It is a system that is lacking direction and is currently organized and operated on a strictly functional level. That is, there are engine repair facilities, there are component repair facilities, there are line and hangar maintenance support groups etc., etc. The airline and or airplane business doesn't run well on a functional basis. It is too complex. It is ultimately most effective when there is a summation of information, labor, operations, inventory, supply chain and other skills integrated into a single whole.

This fragmented approach served a market which evolved from the major carriers filling only segments of their needs while maintaining in-house capability in most other areas. Quite often these were the segments which did not have contractual constraints. So over the years, airlines nipped away and outsourced pieces of their business and new companies evolved supporting those needs. As new airlines started these businesses grew more robust. Today, in the United States, there is an across the board migration by major airlines of airframe maintenance to third party providers, a great deal of the engine and component capability was previously outsourced already and clearly more is occurring now, and many of the line and other support functions are also slowly migrating away from in-house airline accomplishment.

There are plenty of providers but most play minor roles and today in the United States this fragmented business does not have a dominant player with the exception of someone like General Electric in engines services. The big difference, however, is that while in the past most of these providers were local, today they are global. There is an explosion of maintenance services especially in the Far East where labor still wields a large cost advantage. This fragmentation when viewed in light of the exodus of airline in-house maintenance is creating a new business model and a new opportunity balanced with some inherent risks.

This is a very large business. Current airline maintenance expenditures world wide are a 38 billion dollar business. Today world wide there are about 17 thousand plus commercial jet aircraft. In the next ten years there will be over 25 thousand commercial jet aircraft, a fifty percent growth, which will generate maintenance revenues of over 60 billion dollars. In addition as commercial variants are introduced into military fleets there will be even larger growth opportunities.

The stage is being set for an explosive growth. But this growth will manifest itself differently in different parts of the world. Maintenance is clearly being viewed as a growth opportunity by many airlines in the Far East, especially in China, where new facilities and capabilities are growing. The Middle East is one of the fastest growing airline regions with very large development and investment in maintenance infrastructure. India with its vast resources of

highly skilled labor will definitely be a player. Not to be overlooked is the vast resource of engineering talent in Eastern Europe which is capable and cheap by our standards. Europe is well along a path of developing a maintenance service business balanced between airlines and independent MRO's. In the US, which represents about 40% of the market, there is very little recognition or systematic plans to take advantage of this opportunity. The obsession with labor issues and costs has blinded many to this opportunity.

The new MRO business model

The new model that will emerge, especially in the US, will be an entity which will obviously still perform maintenance, but will shift dramatically from the current airline in-house maintenance to a new non-airline maintenance service provider or providers. However, to be effective the current haphazard system of maintenance service organizations will be dramatically revamped

What airlines had created was an integrated system approach of providing total support, albeit for themselves. What is currently happening is the disintegration of that system. The path that airlines are taking today is dispersing the various functions and no one is amalgamating them into a one-stop shop. As the airlines outsource more of their technical requirements, the need for oversight becomes ever and ever more onerous. Where in the past all the work was accomplished in only one or two locations with common standards and training; now it is being dispersed to a variety of facilities and locations, in some cases with different languages and cultures. A new maintenance provider will emerge which will in some ways resemble the old airline models by integrating many of the functions but be independent of any airline and without the burden of the old infrastructure and the interdependencies of that structure. The new entity will provide a totally integrated package of maintenance services, but not necessarily from one facility or from one organization. The new entity will manage maintenance no matter where it is accomplished. The glue that will bind this new model will be the information technology that will cross all the boundaries of location. The driver for this will be both efficiency and, in some ways more importantly, a need to control effectively the maintenance process. Dispersing leads to complexity which can lead to errors which leads to a desire on the part of the regulators for better controls which leads to one-stop shops! <u>But one stop shop may not mean one location or one provider.</u>

The political, labor, and regulatory environment

It is now clear that the business is changing; it is clear that it needs to change; it is clear that airline labor recognizes that change is inevitable; it is clear that a new model will evolve; and it is clear that so far nobody has grasped the full impact of this change.

The key to this business certainly will be safety, quality, compliance and, of course, an ability to provide competitive costs. What is evolving today from all the fragmentation is a need to review the regulations in view of this new reality. Clearly the maintenance providers will have to take more of the oversight responsibility that now singularly rests in the airlines. The providers may have to take on more of the maintenance program responsibilities and reliability

monitoring than what is occurring today. The current operating specifications may well require a more symbiotic relationship with maintenance providers such as shared engineering functions and transparent changes to the maintenance programs based on both operator and provider experience. The new players will unequivocally have to give the FAA confidence that they posses rigorous systems to assure compliance. The FAA will need to focus their approach to oversight with more fundamental understanding of data with less dependence on a hands-on inspections. The FAA will need to focus on trends, on analysis of those trends and on dispatching highly trained audit teams to the facilities which are not performing to expectation. While some random inspections have value and may need to continue, I view the future need being more driven by factual rather than anecdotal information. I see a need, similar to what CDC does when a disease breaks out, for qualified FAA teams to do in-depth hands-on review of packages of work and actual on-site inspections like super NASIPs when data indicates shortcomings.

The industry is now in the limelight with a variety of issues regarding outsourcing, and clearly the FAA will be under greater scrutiny from the labor unions and legislators to do something about it. If there is an incident or accident, then the drive for controls and standardization will greatly intensify. The current maintenance providers and airlines will come under much more intense oversight.

The risk to this new model is that the maintenance landscape is changing over a very broad spectrum of technology, politics, regulations and regulators, control, geography, and mind set. It all is occurring concurrently, and thus it clouds, considering the many facets of the business and the many stakeholders, what kind of holistic outcome will result. There are many disconnected and disjointed efforts focusing only on labor, or regulation, or technology, or ownership, or a myriad of others. The danger of this fragmented or disjointed approach is that programs and initiatives will be introduced which will not be effective and lots of effort will be spend on fixing various isolated symptoms resulting in lack of a coherent solution for a changing system.

To achieve any type of success in the future, MRO business will greatly depend on the FAA's ability to control and regulate today's business reality. Another complicating factor may be the fact that other governmental bodies than that of the US may start driving the regulations. So any attempts and efforts to show that someone in fact can integrate and provide a safer, more compliant product will at first be very difficult but very welcomed. Today's providers are so engrossed in labor and labor rates in their functional areas that they are not focusing on the risk or opportunity of what I believe is the new reality. This reality is that regardless of who does the work there will be a need to control the information flow, to control the standards and to have a holistic view of individual aircraft.

Information-the unifying theory

Most of the efforts today by the maintenance suppliers are about lowering labor cost, especially the rates, and some modest efforts to improve a broken business model. As yet nobody has put together a coherent business plan which creates an integrated support structure. So there is considerable wasted activity with woefully few results.

The industry does not have nor is it developing an integrated database to capture information across many providers of the condition of the equipment, its status in the maintenance program, or real time information of the parts that are on the airplane or even in the various facilities. If someone could provide data and systems to the regulators which effectively manage the maintenance process, it will become the standard from which all other maintenance systems will evolve. Information is the Rosetta stone that unlocks the mystery of maintenance and opens the windows to a great business opportunity.

Manage maintenance services.

The effective MRO provider of the future will both manage and may perform maintenance. It is important to understand that the management of maintenance versus performance could be at different companies and different locations even on different continents. The future provider will require some maintenance capability but may integrate other providers through joint ventures and partnerships. The idea is to integrate maintenance through information technology and either perform it or have it performed. This new world view of maintenance will have no geographic boundaries. It is conceivable that this venture can manage on-shore and off-shore maintenance provided the standards and oversight are maintained and verified through information technology.

The uniqueness of the individual airline maintenance programs, the ability to improve its processes through investment in engineering talent, the capital investment in state of the art equipment, have been challenged in the US airline system and in many cases are being replaced by companies providing services and labor and facilities. The OEM's (original equipment manufacturers) are looking for opportunities to further consolidate and capture the after service market. The airlines a rapidly shedding all the peripheral activities and becoming more and more marketing entities distinguished by their service brands.

This transition is well on its way. It does not necessarily bode a good or bad outcome but it does bode some chaos and uncertainty as all change does. The process will not be reversed. Maintenance is a big business and getting bigger. It will offer new opportunities for value creation as well as challenges. It will require more oversight, more human factors understanding, greater cultural sophistication, greater reliance and understanding of what information the data is providing. It will completely change record keeping and compliance, it will change inventory ownership, and it will be more multilingual, multi-cultural and much more geopolitical. It will require the same unbending discipline to excellence, compliance, and safety that has created this great transportation system.

And most of all it will take vision and an unerring focus to change from reminiscing about the past to executing the dreams of the future. There is no reason why these dreams can and should not be realized by a robust aircraft maintenance providers in the US.