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Future Combat Air System

Take-off : Complex does not mean difficult !

AN INTERVIEW BETWEEN EXPERTS

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Allan Behrens
Hello. My name is Allan Behrens. I am from Taxal. We are industry analysts looking at the linkage between technology and manufacturing. Today we are going to be talking about the topic of the Future Combat Air System and its integration with technology. I'm here with David Almer from Siemens. Hello, David.

David Almer
Hello, Allan.

A.B. : David, what's your interest in the topic?

D.A. : Our customers are requesting us to support them on the journey of Model Based System Engineering in order to adopt the highest technological behaviours, processes and tools in their companies.

A.B. : It is quite a broad area of technology, isn't it?

D.A. : It is. And a lot of challenges are coming up from a point of view that Model Based System Engineering wants to break the differences and barriers between the different engineering disciplines.

A.B. : In so doing, for this particular series of podcasts, we're going to be talking about Model Based System Engineering in a little bit more detail. We're going to be talking about product definition, connected engineering, aircraft performance engineering and quality. You're going to talk about Model Based System Engineering. So just introduce me to the concept: what is Model Based System Engineering?

D.A. : Well, Model Based System Engineering is the harmonisation of the tools and processes across the development cycle of the product.

A.B. : Obviously it has a relation to systems engineering, doesn't it?

D.A. : Absolutely. Let's say systems engineering is the first stone of building this harmonisation. It's imperative today to have a good systems engineering backbone in order to go to and through the different disciplines of engineering.

A.B. : Okay, so explain to me in a bit more detail the concept of Model Based System Engineering.

D.A. : Well, the concept of model based engineering starts from the point of view that we need to interoperate in between the different disciplines in an organisation, not only at the level of the engineering, but also at the level of the requirements and even to provide input for manufacturing.

A.B. : So what does it matter to those listening? Why is this particularly interesting? Why is it a hot topic?

D.A. : Well, it's a hot topic today since we are seeing in the industry that there is a lot of disconnection between the different departments that are developing products. So what we would like to address with the Model Based System Engineering, and that is not a secret, I think all system engineers are aware of that, is that the fact that there is a digital continuity or digital thread between the different disciplines and then this is what we want to achieve, to have a strong and robust digital thread across the organisation.

A.B. :
And it's all the more important in programmes like the Future Combat Air System, which is a hugely complex project, isn't it?

D.A.
In the case of the Future Combat Air System, it is even more critical because the aircraft itself has a high degree of complexity and then the integration between all the subsystems of the aircraft is quite critical and the interaction between these subsystems. So, it's really important to understand that when engineers are developing requirements, these requirements need to be satisfied by the different simulation or design engineers.

A.B. : And it's not just the departments, it's also the design and supply chain...

D.A. : Model Based System Engineering needs to touch all people, all departments, all teams involved in the deployment of this product.

A.B. : Is there a cost if one doesn't employ Model Based System Engineering, what are some of the benefits that can be achieved?

D.A. : Well, first of all, there is the cost of inaction. The cost of inaction means that we are going to continue the Future Combat Air System, as it is today, which means in a completely disconnected way. And then this will lead to delays on the development, delays on the production, and then we cannot afford in this type of product such big delays because the cost is massive.

A.B. : And there's been quite a few examples, haven't there, of delays and challenges, should we say, to previous projects?

D.A. : Well, I think all people in this industry know the situation of the F-35, the American aircraft, that, for instance, was delayed about eight years on the development. So a programme like that, which is delayed by eight years, can have several millions or hundreds of millions of losses during the life cycle.

A.B. : So people really are keen to try and address the challenges that make them miss these guidelines of timescales and costs, don't they? Because costs are also a major point, aren't they? I mean, it's not only the cost of late provision, but it's also the cost of delay within the supply chain.

D.A. : Yeah, absolutely. When we have a delay on this type of product or aircraft, the way that this delay is going to impact the development cycle, it goes in various trends or various directions, not only for the manufacturer, but also for the suppliers. And obviously on all the delays that we are going to rate on certification of the vehicle or the aircraft, and then it's very difficult to estimate from the very beginning what is going to be the impact of delay.

A.B. : Yeah. So who in the companies that you deal with and talk to are particularly involved in Model Based System Engineering? Who does it touch?

D.A. : Well, again, as I said, Model Based System Engineering is impacting many departments, many units, many people in the company. But obviously there are different personas. So there are the classical system engineers that these guys, most of the cases, they are making requirements at the beginning that we're starting by making requirements. But the system engineer world evolved more to system modelling. So then this connection between requirements and system model, as I said before, is the keystone of the model, the system engineering. These people are system architects, these people are people coming from IT, people coming from simulation. There is an ask or there is a direction of integration with simulation, but it's going to obviously impact also all people on the designing phase. So, designers, people making mechanical CAD or electrical CAD, as well as people making programme planning. So, there are a variety of personas that are impacted by model based system engineering.

A.B. : Okay, this sort of ecosystem of complexity, should we call it, what can one do to actually make a difference? What can one do to address the issues?

D.A. : Well, this is a very interesting question. This is a very good one, Allan, because today, for years, companies build their legacy by using specific processes, by using specific tools. People get their expertise by using very dedicated tools. And then now the first thing that needs to be done, it's a maturity assessment of what are all the tools and practises engaged in a specific company. So, this is the very beginning because this is the only way that we will be able to see, to observe, to understand what can be improved.

A.B. : It's fair to say that all these companies have established product processes for their product environments and their aircraft environments. So, one has to live in a heterogeneous environment that exists way before our current thoughts about new technology.

D.A. : Yeah, the original environment will always exist as a software vendor. So we need to be conscious that we need to embrace all the good practises that are already in a specific company. And then obviously, this brings a certain level of complexity. But in the reality, by adopting, by embracing all what is good already. So, we are enriching this number of personas and then we will be able also to put them in another level of maturity in terms of digital thread.

A.B. : You talked about this maturity assessment. What about on from this maturity assessment? What generally happens in the companies that you're aware of?

D.A. : Yeah. So, material assessment, let's say, to assess the maturity of a model based system engineering specific company starts by understanding what are all the aspects that are being addressed in specific companies. Let's say that one of the aspects of Model Based System Engineering could be, for example, the product engineering. So inside of the product engineering there is the system architecture. So, the system architecture is a topic that needs to be addressed in terms of systems engineering. Then what we try to understand is what is the maturity in terms of system architecture? Company has typically, are we talking about managing subdocuments manually or are we having diagrams performing the system architecture of the product? Or are we talking about more advanced tools like XML integration with simulation? Or are we talking to a very high advanced situation of system architecture where we have a fine grain integrated system architecture? So, we need to understand where each user, each team, each unit position themselves with respect to the different topics of the model based system engineering. And then the system architecture is one example.

A.B. : Okay, interesting. Moving on to perhaps a stage beyond how do you measure success how do your customers try and gauge whether or not they're being successful in this change?

D.A. : This is again a very difficult question in Model Based System Engineering, how to rank the success or how to evaluate to quantify the success? Because obviously, when we are interacting with our customers, our users, most of them are asking, okay, what's going to be the ROI of your implementation? The return of investment of your implementation and the return of investment of the implementation of MBSE is something that needs to be measured long term.

A.B. : Have you found that people have got the measurements to measure the initial conditions in the first place? I've noticed that some people say, well, we've not measured how we've worked in the past in some areas. So that is a challenge in its own right, isn't it?

D.A. : It is, but we need to understand that the more we go on very complex systems, the more the cost induced by all these developments is going to be high. This is for sure. Many people are telling us, okay, you are implementing Model Based System Engineering, but the cost of implementing is quite high. However, we're having examples in the industry like the US Air Force when they developed the T7A Trainer so they were able to explain that they were reducing the cost of development by 30% by using digitalisation.

A.B. : Interesting. So if you were to summarise the message from the knowledge that you've accumulated within the world of Model Based System Engineering, what would your words of wisdom be?

D.A. : Well, if I need to summarise, I would like to say that MBSE is a journey. So, this should be done through a step by step approach. It's very difficult to modify the complete structure, socially and technological structure of a company from day to night and say, okay, tomorrow you are going to be fully MBSE. This is the first thing. It's a step-by-step approach. In order to follow this step-by-step approach, to assess the maturity in MBSE is the key thing we need. And once we are able to rank this maturity, then we will be able to take actions in order to enhance specific fields where the customer wants to be at the highest level.

A.B. : So, I mean, that's a very succinct strategy. So, people should get in touch with yourself or your colleagues to try and understand how they can actually achieve it within their business.

D.A. : Well, this is what we are trying to promote. So, we're having different discussions with customers in the market of the Future Combat Air Systems. And then again, one of the first exercise we are doing is to align the vision of MBSE from our side and from the customer side, and then after to conduct maturity assessment rankings.

A.B. : Thank you very much, David.

D.A. : You're welcome. Thank you.