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Future Combat Air System
Stopover: Performance Engieering

AN INTERVIEW BETWEEN EXPERTS

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Allan Behrens
Hello. My name is Allan Berens. I'm from Taxal. We are industry analysts looking at the linkage between technology and manufacturing. I'm now joined by Frank Vossen. Hello, Frank.

Frank Vossen
Hello.

A.B. : Frank, what's your interest in the topic of aircraft performance engineering? Why is it interesting to you?

F.V. : Well, as a presales account development specialist in Siemens, I'm into this performance engineering for 30 years and I do see a lot of untapped potential in aircraft engineering nowadays.

A.B. : What exactly is it? What is aircraft performance engineering?

F.V. : Well, aircraft performance engineering addresses the verification and the validation of required aircraft performances. And that at any phase of the development cycle, from concepts over detailed and to detailed design phases, but also both through simulation and physical testing of components, and systems of the complete aircraft and the integrated performance engineering that addresses the full integrability of other areas which we have been already discussed in other podcasts, and it also affects the way of highest degree of efficiency for this performance engineering is obtained by really tearing down those silos between the different application domains.

A.B. : Right. And why does it matter? The people listening to this podcast are going to be saying, why is this important?

F.V. : Yes, we all know military aircraft integrators and suppliers, they have a lot of experience in this domain and they have done fine things in the past. But we also know that these fighter programmes always exceeded the budget and the timeline. So not only time wise, but also financially. And the complexity of new systems has been increased in the new materials, new missions, which makes that you need to get down to shorter timelines, shorter budget. Well, that should keep awake the audience at night suffering this kind of complexity and ambiguity.

A.B. : So that, I suppose, brings me onto the next question, but what is the cost of inaction? Give us some of the other benefits.

F.V. : Yes, well, we all know that the F-35 has been mentioned before already and typically, for example, for the short take off and vertical landing version of the F-35, there had to be 1200 kilogrammes being taken away for the redesign. That took more than 18 months and a lot of money. And in this redesign, it impacted everything: electrical systems, propulsion, fuel systems and aircraft structures. And the cost of not doing so is you can't develop anymore a new programme with yesterday tools and processes. You don't want to go the same way.

F.V. : And that's where you need to evolve in this integrated way of performance engineering. The aircraft has more composites, has higher power density, lower radar, observability needs, and so we can address this. For example, Rolls-Royce have been investigated and quantified that their engineers are spending 30% of their time looking for the right data to do their job. Yeah, and in Digital engineering article, although it's ten years ago, they said that people are spending for appropriate meshing to do adequate simulation. It could take up to 80% of their project time. It is amazing. Now, today we offer capabilities to have major aircraft engine manufacturers obtaining 50% faster throughput of their simulation modelling activities. And that's what it is all for.

A.B. : And this is an area that areas of technology we're talking about really help. But to whom in the audience does this really affect? Are there specific roles that are affected by this sort of performance engineering?

F.V. : Yes, when we talk about performance engineering, it really touches the core of the product the aircraft manufacturer or the supplier is making. So, it's really down to aircraft systems and the aircraft itself. And that's up to the component subsystem or the full aircraft. And like we have been talking in an MBSE context, obviously also systems engineers can benefit from there at the early concept design phases to, for example, use generative engineering solutions or system simulation solutions for balancing performance attributes at a very early stage. But not only these benefit from that. The most obvious ones are aircraft engineering departments, such as the ones for taking care of flight, physics engineering aerodynamics, aeroelasticity, guys who are using accurate and efficient computer fuel dynamics in combination with structural finite element analysis, analysing ground loads, flutter, gusting, turbulence in transonic and subsonic flights. And not only in the simulation way, but also on the physical test equipment, making sure that you execute ground fabrication tests, for example, and flight flutter tests with proven gains, reducing really total throughput time for a measurement campaign without jeopardising the accuracy and minimising the test pilot's exposure to flutter, for example.

A.B. : You sort of touched on my next question, which is so how can one address the issues that you've talked about in the past, these sort of delays and inaccuracies and the lack of optimization, how do you address it?

F.V. : Well, typically you see that there are quite some we have been experienced quite some gaps in the silos. The operational people are working in an operation way. Don't forget that these flight programmes or these new fighter programmes are not only treated in your company in a siloed way, but also with a lot of partners. For example, the F-35 has 1900 companies dealing with this aircraft. But that means that you need to make sure where are the gaps and check the low hanging fruit. Like I said, there is quite some potential. We approach the customer to see where we can really benefit from the super suite of tools that are out there taking care also of their own in-house solutions. If they are there and they are smart and they're good, well, keep them.

A.B. : Yes. And I suppose one has to bear in mind that these are never greenfield sites. These are all brownfield sites, aren't they? I suppose in some way you've got to work with some of your competitors.

F.V. : Yes, and that's where indeed the good thing is that we are open and there's an open environment in this way is whatever kind of computer data design model, the model that is out there, or a system simulation model is out there. We can take it in and take doing performance analysis on any kind of variety of physics, name it, thermal, mechanical, hydraulic, multibody simulation, whatever. We can take care of that. And we try to bring in all these, let's say, multi environments into one integrated way of performance engineering because that's important. People want to spend their time on engineering the aircraft and not engineering the programme or the interfaces of the solutions they're working with.

A.B. : So how do you start the process of integration and implementation?

F.V. : Well, typically in a performance engineering way, these are pretty focused areas and where we tend to make sure that, hey, look out there : what's your colleague doing and what your colleague is working with? And how can you collaborate better with it in this one and the same platform? So, it's working with the kind of audits and checking out how they are working today to make their life better tomorrow.

A.B. : And what is success? How do you measure success? How do your customers know that they're succeeding when they are going through this changing process?

F.V. : Well, typically the obvious time is cost and time spent, but you only know what it has been costed if the programme is over. But for sure, there are a number of hidden kind of indicators, or measurables that you say, okay, the share of number of decisions that being made based on simulations, for example, or the number of prototypes that you need to test before you say okay, it's certified, it's validated. There you can really shorten the time, shorten the cost, but also reduce the number of prototypes, for example, to reduce and again, also reducing the certification time by a factor of two is possible.

A.B. : Right. Interesting. So, in summary, where should people start? How do they get going? And how can you help? By advising them on what they need to do next?

F.V. : Well it is to do an introspection on what their current practises are. And yes, reflect on how much time do I spend on finding the right data latest version, or preparing models for your type of analysis, or prepare an execution of a final validation test. How much time do I spend? And if it's really more important to focus on doing my real engineering work, come and see us.

A.B. : Right. Thank you

F.V. : You're welcome.