SIEMENS

Future Combat Air System
Stopover: Connected Engineering

AN INTERVIEW BETWEEN EXPERTS

Click here to listen to the podcast now !

Allan Behrens
Hello. My name's Alan Berens. I'm from Taxel. We are industry analysts looking at the linkage between technology and manufacturing. I'm now joined by Nuri Zughaid and we're obviously on the topic of the future combat air system. And we're talking now about connected engineering. Hello, Nuri. Just give us a bit of background on what you do and why you're interested in the topic.

Nuri Zughaid
Hi, Alan. I support customers in the digital transformation, you could call it, on electrical electronics systems development. So everything from the efficacy of an electrical system, the electronics, as well as the communications and the installation of those electrical systems into products, machines, complex machines.

A.B. : Or vehicles, and in particular on aircraft, because obviously we're talking about the future combat air system. What does it mean to them? Why is it so important what you do?

N.Z. : Well, the electrical electronic system on an aircraft, especially the new future combat air systems, have an awful lot of electrical electronic systems. They are fly by wire, they are completely controlled electronically with wires, with communications. And so having optimal architectures of the electronics and wire harness systems makes for an optimal efficient aircraft and aircraft that can achieve its mission parameters or goals.

A.B. : Right. You must have some examples of where it's all gone wrong. I mean, I suppose people are keen to hear of their successes and they also want to understand and learn from people's failures. Give us an example of what's happened in the past that you're there to solve.

N.Z. : I mean, there have been some major OEMs where the electrical wire installation system has caused a delay in achieving flight certification because of wires not correctly segregated in the bundles of the aircraft. These regulations are there for the safety, whether it's a commercial aviation or military or other applications, is there for the safety of everybody.

A.B. : Just give us an idea of scale. How big a problem is this?

N.Z. : Billions of dollars and delays in programmes, potentially lost orders, a huge impact on the OEM, developing the aircraft, trying to sell the aircraft. But of course, the delays knock on for years, potentially.

A.B. : And also there's a positive benefit, isn't there? I mean, you're there trying to integrate complex electronics and wiring and harnesses and things like that into these aircraft systems. And it's about weight, it's about efficiency. Give us some ideas of some of the areas which can be affected.

N.Z. : So weight is one important element. These aircraft, every gramme of additional unnecessary weight in the wire harness or the electrical system reduces the overall range the aircraft can fly and their mission parameters it originally set out to achieve. So weight is important. And also the systems that electronic platform domain is actually managing, there's more and more communication and making sure signals are achieving, reaching their destination in time. All of these are measures of impacted, I should say, from the electrical system.

A.B. : And this is all the more important these days because these are software driven machines, aren't they? I mean, it's a software world with electronics that is the foundation of it.

N.Z. : That's right. The number of lines of code that were predicted years back in terms of what would be in a vehicle or an aircraft, it's been growing exponentially. These are software driven electrical electronic systems, highly complex. So getting that right architecture is very.

A.B. : Important and embedding obviously, into physical structure, isn't it? That's another issue, isn't it? You mentioned to me when we were chatting about this earlier, about where these projects have gone wrong, where things have happened or shouldn't have happened. Just share some of those examples.

N.Z. : Well, why harnesses where they've had wires of different signals, different power and data signals running together in the same bundle? That's a no no for electromagnetic interference. It could be scrapage or delays in the manufacturing process as you ramp up.

A.B. : And the connectivity you talked about, you know, one particular example where people have had a challenge even within the software, within the infrastructure, not being able to connect different versions of aircraft together.

N.Z. : That's right. Concurrent engineering. I mean, the electrical electronic systems are very important, but it's one system and an aircraft, and so the codesign between, say, the mechanical engineering domain and the electrical domain is important, ensuring that at the end, the wire harnesses reach their intended equipment that they plug in together. You've got the correct connector, you've got the correct clocking angles. All of these things mean that we have to design in concurrency with our neighbours as our mechanical engineers. And so connected engineering is about connecting all adjacent domains with each other.

A.B. : Great. And who in particular, within the companies that you deal with, are particularly affected by these sorts of technologies? Challenges, solutions.

N.Z. : Everybody in the organisation could be affected. Getting the electrical electronic system wrong can put the whole organisation at risk. If we think about the delays in an aircraft programme and the billions of dollars that could cost you. So it's the programme manager who's responsible for delivering the aircraft on time to the first customers. It could be the manufacturing manager who has to ramp up production of those electrical wire harnesses, or the person responsible for the service documentation generating that service documentation. All of these have a play because everything needs to be done in a shorter time frame.

A.B. : So, as an expert, you've obviously worked with a number of companies who have these challenges. What do you say to them about how they might address the issues that they've had in the past?

N.Z. : Well, a lot of the issues they may have had in the past have been because they have homegrown development tooling, they've got in house skills, perhaps, but they've suffered from silos and disconnects between each of the disciplines. A system engineer in the past may have developed an architecture that's gone to the electrical engineer and then after they've created their first set of serious schematics, it's then much later integrated into the aircraft. Really, it's about joining all these different segments together, or domains together and having everybody working concurrently and optimising concurrently. The mechanical with the electrical, the electronics with the avionics. All of this can be done together.

A.B. : Do you talk about sort of implementation workflows or schedules? I mean, how do you go about actually physically getting this all done?

N.Z. : Every customer is different today. We have experts in our organisation who can help with that digital transformation, who can address in steps and phases that transformation from there as is, workflow all the way through a new transformational development following this model based systems engineering approach, where you have that traceability, that connected engineering.

A.B. : So it's important to understand the current situation before obviously moving on to where are you going to go? What about measuring success? How do you go about, okay, you've advised and you're doing some sort of strategies and implementations. What does success look like?

N.Z. : Well, first of all, success is not failure. Avoiding those costly mistakes, achieving your development parameters, your requirements on time validating that. You have implemented all your requirements that's on the main architecture and the design of the electrical systems. When we look at and try to measure success in the manufacturing is the ramp up time. How quickly can you get to your ramp up goals in terms of number of aircraft per year? Or it could be the zero scrappage. One customer of ours actually measures engineering change orders, the frequency at which changes are being introduced in the manufacturing because of late changes in the early design of that aircraft. Right.

A.B. : So the ability to predict and optimise produces this downstream benefit?

N.Z. : Absolutely. It's a downstream benefit in not only a more efficient architecture, but ramping up and following generative processes for the manufacturing.

A.B. : Generative. Just explain generative to me.

N.Z. : So generative is using repeatable model-based approaches for design, to support design. So if an input changes following a generative process, I can very quickly, at the touch of a button, generate the new set of connectivity or the new set of work instructions for the manufacturing of a harness. Those are generative processes in my domain.

A.B. : Fantastic. So if you were to say to a company, this is why you need to think of this and look at potentially how you're doing, what you're doing, how do you get started? What do they need to do? What do they need to consider?

N.Z. : One thing is to try and understand what's the scope that they want to achieve on their first attempt at moving towards these kinds of tools, getting buy in from people within the organisation that will actually support this transformation. This transformation changes organisations, it changes, it dissolves silos. And so having the correct sponsorship can really support this kind of transformation and then have open tools and have departments working with each other. And I think that's how you can achieve this.

A.B. : Right. And next steps, if somebody's interested. What should they do now?

N.Z. : Find experts. Find people who can support perhaps there's people within your own organisation with model based systems experience that can really understand the value in connected engineering or companies like my own, where we have experts who support customers today in this digital transformation, all the way from initial architectures and how to optimise those architectures, all the way through to manufacturing or to generation of service documentation. These can all be stakeholders where we can bite size support in a transformation.

A.B. : Great. Thank you very much. Nuri.