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Episode 2: The Future of STEM and Aerospace Engineering [Podcast]

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In this episode, we sit down with Dr. Magdy Attia, a professor of Aerospace Engineering at Embry Riddle Aeronautical University, and we discuss the current state of the STEM industries, and the future of where the industries are going, along with potential litigation roadblocks for these industries.

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Episode 2- The Future of STEM and Aerospace Engineering

Teresa Barber: Putting your futurist's cap on, looking ahead again, see we're, you're predicting now we're going to have some ideas plucked out by commercial interests. Specifically for commercial litigators, what's on the horizon in two to five years? What are we going to see that could potentially lead to areas of commercial dispute? Now, I'm not at all asking you ... You know, no confidences broken. Let's not mention specific brands or anything. But just in general, what are the trends that you're really paying attention to and curious about that could impact commercial litigations practices ahead?

Dr. Magdy Attia: Of course. That's a great question. I just attended a presentation by a professor from Canada, and he gave a very engaging presentation, and on his last slide he showed this line, and I thought it was fantastic. He said, "If you want to learn something new, read an old book." I thought that was really telling. In my field, we're starting to see the reemergence of old ideas that good, smart engineers came up with a long time ago, but maybe they did or did not have the capacity to see it through or build it. Maybe the material wasn't there, maybe the supporting technology wasn't there. So, we're seeing the reintroduction of old ideas as new ideas. That is going to lead to some very interesting intellectual property discussions.

Dr. Magdy Attia: As you may know, there are three types of patents: What I like to call patents for patent trolls. Those are folks who just, who are just interested in the financial aspect. Maybe they see an idea, they examine it, they see it wasn't patented, they'll just file a patent and either sue for infringement or hope to be bought out. We call them just patent trolls.

Teresa Barber: Or non-practicing entities, yeah.

Dr. Magdy Attia: Yes.

Teresa Barber: Yeah.

Dr. Magdy Attia: Yes, absolutely. The other type are the true innovation. The really genius ideas that deserve the patent.

Dr. Magdy Attia: The third category which is getting to be quite substantial is what I like to call tactical patents. Now, these are patents who just, at a glance you may think, "Maybe they're not really that clever or that innovative. I've seen something like that before." Innovation-wise, you might give them a C or a D+, but they're really there to protect an old idea that is reemerging, and that makes for a very, very interesting discussion and a very complex litigation ... if it reaches that level.

Teresa Barber: Very good. You mentioned the proliferation and emergence of computing in the last, you know, I would say decade plus.

Dr. Magdy Attia: Plus, yeah.

Teresa Barber: What else has been really just transformative? Anything else that you would point to and say, "This is really, you know, this is something that sets today's engineering, today's aerospace engineering apart from that of the '50s, the '60s, the early 2000s"?

Dr. Magdy Attia: Well, the aerospace engineering industry, the aerospace industry as a whole is very, very risk-averse. They don't like to do anything radical. Their changes are very, very incremental. So, the answer to your question is a little bit elusive, but I ... I saw in my time that I think the most advancement was in the area of materials ... aerospace materials. Materials have gotten progressively very strong, very light, very temperature-resistant. The advancement in materials has been, I think, one of the most interesting and one of the most compelling. We are able to load six, seven hundred people on an aircraft and fly it for hours and hours and hours. Yes, we've made advancement in component efficiencies and lift, et cetera, but it's really been at the forefront, it's been materials.

Teresa Barber: Magdy, what's your favorite project, problem that you've ever been able to solve?

Dr. Magdy Attia: That's a very interesting question. When I was at industry ... The answer is easy When I was at industry, I graduated with a Ph.D. and no experience. I did all of my degrees in a row, so it took me a while to find just the right job, and I found it and it was great. And I remember my boss coming to me after I've only started for a few months and saying, "Well, you know, we hired you with a Ph.D. What can you do for thus, for us?" I said, "What do you need done?" He said, "Well, we want to be able to design a component and be so confident in the result that we don't have to test it. Can you do that for us?" I thought to myself, "This is going to be a short career." But I was fortunate enough to have a little bit of a downtime, we had just finished a major design and we had some downtime, and I started thinking about the set of design codes that I had and how I could rig them to do something they were not supposed to do, and we did it. We redesigned a major component. I can't talk about specifics, but we were very confident and we ... we built the engine, and I believe we gave a discount to the first customer because we were also going to do some testing on the customer's side, and the component achieved exactly what it was supposed to achieve, and we were very happy. That was a very good year for me, and that will always be, I think, my favorite problem that we solved.

Teresa Barber: I was going to ask you: Tell me about a big challenge that you had to overcome, a real, you know, really difficult challenge you had to solve, but it sounds like that might've been maybe one of the most, and one of your favorites, so.

Dr. Magdy Attia: That was it. That was the biggest challenge so far in my career, and it was early, it was early in my career too.

Teresa Barber: And clearly it didn't cut your career short. You overcame and you're still here, fighting another day.

Dr. Magdy Attia: Thank God I'm still here, yes.

Teresa Barber: One thing you and I had been speaking about previously or kind of talking about were some of the industry trends. In the last few years we've seen a bit of a shift from commercial ... from publicly-funded space launch development, launch development, especially in the US, to commercialized launch and the emergence of giants now like SpaceX and ... So, what are you seeing, what are you, how disruptive do you think that is for the aerospace industry? What do you think we'll be seeing in about, you know, these are companies that really weren't really on the tip of our tongues five years ago, right? But now they're kind of becoming, kind of becoming a lot more, a lot more known throughout the general population. What do you think this will mean for commercial launch, for space launch in the future?

Dr. Magdy Attia: Well, I think handing it over to the private sector has some pros and cons. Number one, I think we've all had some experiences where the government, as well-regulated as it is, and as safety conscious as it is, may be a bit slow in adapting to the times. The private sector is not encumbered by that, and that's a plus. They have been able to come up with some very innovative techniques, and have really filled in the gap that the space shuttle program had left open very quickly and very efficiently. So, that's a plus.

Dr. Magdy Attia: What can be a negative is that when these companies become multinational and all of a sudden you don't have the control that you once had on the technology. And so, I think we as a nation, we as experts, we just need to continue to pay attention to that. Who owns the technology? Where is it being developed? Where is it going? Do we know? And that's really the important question.

Dr. Magdy Attia: But that's with the space sector. With the aerospace industry in general, it's really the proliferation of computers. It's the proliferation of handing things over to the computer. Now, as you know, computer programs and computer algorithms, they are written by folks with a computer science degree or with a

software engineer, engineering degree, so they may or may not have a solid understanding of the fundamentals of aerospace engineering ... and codes and algorithms are being developed and written faster than we can keep track of, and I see that as a potential problem. It is a benefit. The computer is very quick, but can we really replace the human with a computer? That's really the question that is being asked all the time. Can the computer do everything that a human can? Not just in the calculation and the control, but in the anticipation phase, and what to do when things go wrong. That, I believe, is going to be one of the cornerstones of our success in the aerospace industry as a whole.

Teresa Barber: That's interesting. So, you know, thinking about where the industry is going, to my mind, you know, I think of the emergence of massive, massive passenger aircraft, and I think of charter jets being], lots of startups over the last several years, you know, being utilized for commercial, for business travel and commercial, commercialization, but the effect of digitization's really fascinating, what, and I'm sure you have an interesting perspective too with your role with Embry-Riddle. So, what, how are universities and how are graduate programs preparing the next generation of engineers given, you know, given now the, the need to be proficient in software language? Or on the other side, how are other programs, other graduate programs who would be preparing software engineers preparing them for kind of cross-industry applications? If that makes sense.

Dr. Magdy Attia: Yes. Yes, it does. Universities have always, in my opinion, led the way. They've always examined what could be long before industry got their hands on it. To be fair, yes, there is a big different between an idea and a certified marketable product, but without the idea you couldn't really get there. So, you need a lot of ideas even if you throw out 95% of them, and ideas emerge, for the most part, I know some people with disagree with me, but for the most part ideas emerge at universities, especially at the graduate student level where you have these fresh minds; they just finished with their education and they are unencumbered by production delays and certification and paperwork and reports and meetings and they're just free to think and to dream.

Dr. Magdy Attia: At most universities, and mine in particular, we are very keen now on the future of technology. So, hybrid, hybrid electric vehicles, unmanned vehicles. All of that is going on at almost every level. Freshmen and sophomores are members of teams that build, design, build and operate unmanned aerial vehicles, land vehicles. We have a rocket club that for a long time held the amateur record for altitude. They built, they designed, built and launched the record, the rocket, and I believe the record was 38 miles altitude, which they held as an amateur club of students.

Teresa Barber: The overall record. The record.

Dr. Magdy Attia: The record for amateurs.

Teresa Barber: Okay, okay. Got it, got it.

Dr. Magdy Attia: We're not competing with NASA or SpaceX. For amateurs. Which is really good for students.

Dr. Magdy Attia: So, I think the future, the future looks good. There are a lot of students who are coming up with some great ideas, and they get to test them, and the industry is watching. I know they're watching, and every once in a while they'll grab an idea and turn it into a product.