AFRL AUTONOMY TRANSRIPT EPISODE 1

Jim Overholt

Hi! I'm Jim Overholt, senior scientist and autonomist systems from AFRL and today I'm joined with my friend and colleague Kris Kearns. We're going to talk to you about autonomy systems and specifically the science and technology strategy for autonomy system for AFRL. I serve the roll as the senior scientist for technology across AFRL. Even though I'm in the human effectiveness directorate, Kris Kerns is the portfolio manager across AFRL and is also in the human effectiveness directorate.

Kris Kearns

So Jim says what we have in AFRL autonomy strategy. We have a team that includes all of the people across AFRL. If you're not familiar with the AFRL organization, what we have are different technology directorates that cut across the different technology products that we deliver. So things like Aerospace Systems, Munitions, Weapons, Material's and Manufacturing, human performance as Jim mentioned. In addition, we have also sensors and information systems, and so these are the technology directorates that make up most of the developmental programs in our AFRL portfolio. We also have Air Force Office Scientific Research US funding basic research and autonomy. So, as we come together as this AFRL team what hopefully you can see is that what we deliver is technology products it cuts across a different technologies that we deliver and that is all the autonomy portfolio that we have. And just like we have different technology directorates working on technologies we also have different products that cut across the different domains that we deliver products for. So, while a lot of people will hear autonomy, and they'll think unmanned system. That's one of the technology areas that we deliver technology for, and we care about these systems having the intelligence to be able to fly around, not run into things, be able to land, be able to do other parts of the mission on their own. But there's a broader spectrum of domains and technologies that we deliver.

Jim Overholt

You know, so with regards to that, so it's not just the platforms were interested in but the application of technology systems that are actually already in space. Cyber systems, ISR systems, these are all the kind of technologies that autonomy can support and help the war fighter be able to accomplish his missions, so when we're talking about a space systems being able to react to something that's naturally occurring like solar flare and be able to redirect the sensing, sensitive sensing equipment on a satellite, or different types of space platforms. When you see the ISR analyst and dealing with a significant amount of data we want to be able to develop autonomy technologies to be able to process that data, and to understand that data. These are all critical areas of autonomist systems don't traditionally get looked at from supporting and all of these provide products and one of the big product areas that we talked about is this idea of flex weapon. So flex weapons will take in some of these variety of these different types of technologies, things like understanding and allowing it to fly and being able to contact satellites being able to understand where it's at, and being able to process information in such a way that while

its accomplishing it's mission its being able to analyze the data and be able to select the appropriate targets.

Kris Kearns

So when we say we have, we have autonomous systems and today a lot of people might think that we have autonomous systems today because they hear about the Air Force flying unmanned platforms all over the place. But if you look at those unmanned platforms and you peel back and say what's underneath there, what's going on underneath there. What you will find is that there's enormous amount of manpower and so while these things aren't manned there's a lot of people behind the scenes doing things like piloting them, operating the sensors that are on board, there sitting back in another area analyzing that data, processing that data, making sense out of that data. And we are talking towards hundreds of people who are sitting there supporting this unmanned system and the mission operation.

Jim Overholt

Don't forget also, one of the key things is you're doing these with literally like you say hundreds of people supporting these missions across thousands of miles as well. So it's not something that's next door. We are talking about assets in New Mexico controlling assets at some other part of the world. So it is a difficult, difficult problem, and one of the things we like to talk about its unmanned systems or unmanned vehicles in name only because were dealing with so many different people involved with the successful application of that mission.

Kris Kearns

So along those lines then what we talk a lot about autonomy technologies and improve our manpower efficiencies we through people at a lot of problems today and a number of those problems are things that we could create intelligent machines that could do that work for. We also care about rapid response so you can think of environments where in the computer realm where people could not respond to things that are happening fast enough so why not teach or create an intelligent system that could do those things that can't have people do. As the Air Force we care a lot about operating in a 24/7 environment, people get tired, we need rest, we don't function as well once we get tired, systems that can supplement and provide 24/7 per assistance is a significant area of payoff for our autonomous systems. In addition we also want to operate in harsh environments and while we put our Airman in those environments there are some that probably would be better if we didn't put them in. And so autonomous systems that are intelligent enough that know how to navigate and how to work though those environments is another area that we can address and we can create technology in the autonomy realm. And finally as you think about what is the futures going to be there's probably all sorts of new mission requirements that we can't think of or conceive of today, but if we had autonomous systems we would be able to operate more efficiently so it's about creating these autonomous systems can create new opportunities and new efficiencies for the Air Force over all the domains that we talked about.

Jim Overholt

And that's such a great point because you're starting to see that already those folks doing the con ops, and the tactics techniques procedures there already going through saying if I had these autonomous systems what kind of missions or how could I change my mission perimeters in order to be more successful and again more successful and extremely effective in terms of costs, fuel savings, hours on the job, all these different things. You're hitting on a very important valuable point.

Kris Kearns

So, you can't talk about autonomy very long with defining what it is your talking about in that context you usually also hear the term automation that comes into play. So we need to define what we mean by autonomy, and what we mean by automation.

Jim Overholt

So do you want to handle this, or me?

Kris Kearns

Go right ahead.

Jim Overholt

Oh lucky me! Okay, so automation so there's lots of different definitions folks have for autonomy and automation. We take a real simple approach. We look at automation autonomy being the opposite ends of a continuous spectrum. Automation really talks about systems being able to carry out functions where they know what the kind of conditions, what the environments going to be, anticipated types of effects, they know these. So, humans its very hands off the systems are performing they perform fairly well at because we know what is going to happen. The key thing about autonomy and this is what um that was trying to strive for in forms of technology capabilities is being able to handle unanticipated events when we go out and do a mission so these kind of ideas of dynamism in the environment, things we didn't necessarily anticipate new effects that we didn't anticipate, new adversaries, new information that we've never seen before. An autonomous system has to be able to react to that and stay safe and within some kind of parameter of safety and performance. So in that way an autonomous system we can be thinking of it being self-governing and self-controlling. So, these are at the opposite ends of a spectrum of a continuing autonomy. The other key thing about this is, it's got to be flexible and agile across that spectrum, and from that stand point you know what we're talking about in terms of were looking at this ability of autonomy to move at any point up and down the spectrum especially when you get into very complex contested missions.

Kris Kearns

And I think with everything that you just said, nothing in what you just defined suggest that it's with or without people.

Jim Overholt

Oh absolutely!

Kris Kearns

And so we are not talking about autonomous system being something that does not involve people. And so when we start talking about our strategy and we start walking a little bit more though that what I think will be clearer is that we can have automation with or without people. And we can have autonomy with or without people.

Jim Overholt

And that's really your absolutely correct.

Kris Kearns

So based on that understanding then, what we did in AFRL is we created a vision and a strategy. And our vision just to kind of key back on what we just said is it's all about intelligent machines seamlessly integrated with people. So again, it's not about taking people out of the loop or replacing people with machines, but lets create the intelligent machine that can do things, and we can seamlessly integrate it and put it together with a person, and get the two to work together, so that we maximize the mission performance in these complex and contested environments that the military has to operate in. So when we take that vision and we break it down and we ask ourselves what are the major challenges, what are the major goals that were going to need to achieve to be able to realize this vision? We came up with four; the first one is all about creating these highly effective human-machine teams. So again people and machines bringing the two together letting machines do what machines are good at having people there involved and doing the things that people are good at. The second one then is about when we have intelligent machines we also would like to have machines that can work together and can coordinate what they can do with each other in a very similar manner as what people working together would do.

Jim Overhold

Right! And the thing that we want to point out to people when we're talking about that those are two technologies, right? It's that human machine technology coordinated and being very effective. But were also interested in teams of machines coming together and they could be different types of machines. So were talking about humans working with information processing connecting to a remotely piloted aircraft. So we look at all those across the technologies needed to really make that happen.

Kris Kearns

Right! Our third goal then is because we are the military we have to operate in complex contested environments so like you said earlier when you're talking about space if there is a solar flare the system needs to be smart enough to know that and know how to protect itself from something like that. In addition, as we start seeing more systems in the national air space being able to perform and operate in those environments safely and as a way we would expect them. And then finally underlying all of these is how do we test and evaluate, verify and validate. So ensuring that these systems operate safely and effectively in these dynamic and unanticipated environments which is going to be key to being able to demonstrate that these things are safe they operate the way we would want to.

Jim Overholt

So, kind of going back over everything that you just said so were talking about developing technologies with those first two goals. Looking at the environments that they are going to be put in and being sure that they are going to perform the way we want them to do, um they could be performing at higher level, but performing safe as well, that's the key part of what this autonomy AFRL strategy is all about.

Kris Kearns

So in further POD casts then or videos we will go over each one, take each one of our goals and we will dig deeper into it to give you a more clearer idea and deeper understanding of what do we mean by each of these goals and what do we think are the major challenges or what we will be working on to achieve those goals.

Jim Overholt

Sounds great!