DEPARTMENT OF DEFENSE BLOGGERS ROUNDTABLE WITH DAVID MORTON, U.S. ARMY RESEARCH LABORATORY, COOPERATIVE AGREEMENT MANAGER FOR FLEXIBLE DISPLAY CENTER AT ARIZONA STATE UNIVERSITY; GREGORY RAUPP, DIRECTOR, FLEXIBLE DISPLAY CENTER; NICHOLAS COLANERI, ASSOCIATE DIRECTOR, FLEXIBLE DISPLAY CENTER VIA TELECONFERENCE FROM ARIZONA STATE UNIVERSITY TIME: 3:28 P.M. EDT DATE: TUESDAY, OCTOBER 28, 2008

(Note: Please refer to www.dod.mil for more information.)

LINDY KYZER (Army Public Affairs): Well, I think we can go ahead and get started, then. We are expecting one other person, but they can certainly join us midstream if they -- if they do dial in.

We're very excited to have Dr. David Morton with the U.S. Army Research Laboratory, cooperative agreement manager for the Flexible Display Center and Dr. Gregory -- I'm going to butcher these names -- Raupp?

MR. RAUPP: That was excellent. Good German pronunciation.

MS. KYZER: I am a hearty German. I was a -- (inaudible name) -- and now a Kyzer, so I should -- I should try -- MR. RAUPP: You got it just right.

MS. KYZER: He's the director of the Flexible Display Center at Arizona State University. We also have Dr. Nicholas Colaneri --

MR. COLANERI: Oh, I was expect the Italian to be worse. No, that's spot on.

MS. KYZER: -- (laughs) -- associate director of Flexible Display Center at Arizona State University. We're very pleased to have them with us today. They are going to talk about how they are revolutionizing the way we view -- I did worse with "revolutionizing" than I did with the names -- revolutionizing the way we view information. So they're here to talk about their work with the Flexible Display Center.

I will turn it over to them. For the bloggers on the line, we just remind you to please keep your mute button pressed when you're not speaking. They'll start out with some opening comments and then we'll take your questions. So gentlemen, go ahead and get us started.

MR. RAUPP: Okay. David, would you like to start on sort of the Army motivation?

MR. MORTON: So the Army motivation is to give the soldiers the best situational awareness that we can to save lives. We recognize that flexible display technology is a new capability that will not only make the things we do

now better, but will enable us to give the soldiers information in ways we cannot do at the moment. And because of that, the Army formed a cooperative agreement with Arizona State University to speed the development of flexible displays for the soldier.

So we're looking at the materials and manufacturing issues to make these devices. We also want to provide demonstrators so that we can get them inserted into Army systems as soon as possible. And we want to make the load for the soldier to be reduced. The technologies we look at reduce the power, reduce the weight, provide better capability in almost all environments.

So again, the goal is to speed the development of flexible displays, get them into the hands of the soldier as quickly as possible, make the technology available for commercial use so it can be manufactured, so we can buy it at a reasonable cost and insert it into systems.

MR. RAUPP: Thanks, David. This is Greg Raupp. So ASU is actually honored to have this great opportunity to work with the Army to advance this technology. What the Army ultimately wants is commercial versions of flexible display, so our mission is to speed the commercialization of flex displays. In realizing that mission, we work intensely with a large group of industry partners, as well as the Army Research Labs, working cooperatively -- (audio break from source) -- can't do that. MR. MORTON: Sorry.

MR. RAUPP: David just hit mute accidentally, so hopefully -- (laughs) -- I'll start over at that point.

So we're working intensely together to break down the technological barriers to transitioning high information content, active matrix display technology to flexible format.

So there's a number of key technological barriers to overcome. We've been working on those steadily in the last four-and-a-half years, now to the point where we're making very high-quality- technology demonstrator panels that our integrator partners then take and put into fully functional devices that they can put in the hands of the warfighters in controlled field exercises for evaluation.

We're to the point now where we can see that commercialization of flexible displays will happen shortly. We like to think of this as the dawn of the flexible display age.

In terms of the technology that we're developing, it is what I would call the non-mainstream technologies, in the sense that what dominates display technology now is, in the high information content world, is the LCD, the liquid crystal display, sometimes called TFT LCD. That's a technology that really isn't well-suited to flex and can't provide some of the things that the Army would like.

So for example, we instead are focused on the electrophoretic inks or E Ink technology that are daylight-readable, extremely low- power displays and intrinsically flexible in their own right. At least the front plane imaging layer is flexible. And then for advanced applications, where the display will look more like your LCD high-def TV does now, we're looking at the OLED emissive displays as well.

So those two different technologies have different technological hurdles to overcome. We're working on them in parallel and making some real good advances as we go.

MR. MORTON: I think that's the end of intro remarks. (Laughs.)

MS. KYZER: Okay.

MR. MORTON: Didn't want to go too long on those.

MS. KYZER: Well, we'll go ahead and open up to questions now. We'll start with -- (name inaudible).

I know that you were the first online. Do you have a question? Q Yes. Sorry, just a little problem with the mute button there.

Just wanted to say thanks, gentlemen. Really appreciate you taking the time to explain some of this.

One of the first questions I had you kind of hit on when you were talking about it, about the power sourcing issues and it reducing the need for that power source exponentially. But how much of a reduction are we talking about?

I mean, standard-size display -- just ballpark. Are we talking in, like, double-A-type battery or are we talking something slightly larger than that?

MR. RAUPP: Well, for the electrophoretic displays, if you've had one of the commercial ink-on-glass display technologies in your hand, say the Amazon Kindle or a Sony eReader, they are very, very low-power devices. The display has no backlight, so there's nothing from that perspective to draw power, unlike the LCDs, but perhaps more importantly, there are so-called Bistable Displays. If you remove the power supply, if you pull the batteries out, unplug it, what have you, the image remains. The image can actually remain for months without additional power. So you only need power to change the image. If you're just looking at a series of maps or reading pages from a document -- extremely, extremely low-power displays. We sometimes call them zero-power displays, which isn't quite right, but it's almost right. (Laughs.) So the power savings is at least two orders of magnitude over an LCD screen of comparable size and resolution.

For the OLEDs -- those are current-driven devices that require continuous current to light up the OLED devices themselves in the display. But the projections are for the kind of state-of-the-art OLEDs that could be produced, and dependent somewhat on usage, that you might get a factor of two to three power savings over an LCD with comparable usage.

So for one, it's quite dramatic. For the other, it's a reasonable factor, both of which could either dramatically extend the battery life for your device, particularly a human portable device, or -- or could result in lower weight in terms of what you've got to carry in terms of batteries.

Q Exactly. Yeah, it's always one of the concerns they have, and it sounds like even the two to three that you were talking about is exponentially a lot better.

The other question I had real quick, before I turn it over to the -- (inaudible) -- has been, with most of these I'm assuming, since in the field and usability and stuff, I'm making the guesstimate it's probably going to be touch screen technology. Correct? Or is that incorrect?

MR. RAUPP: Well, we're hearing from the users that touch is in. (Laughter.) I think a lot of that is driven by what people are seeing commercially available. And we have contacted a number of partners. Again, we work -- we work with partners heavily, so we're working with a number of partners on integrating their touch screens with our technology. We have a demo actually now -- I think the video is on our website -- of -- we've integrated an inductive touch screen with a plastic -- (inaudible) -- display and demonstrated touch and right on capability with that.

So the things like touch and other what I would call auxiliary technologies that dramatically enhance the usability of the display are things we're looking at as well.

Q Okay, awesome. Thank you very much.

MS. KYZER: Great. Go ahead now -- I didn't catch your first name. Arkamp (ph) -- what's your first name?

Q My name is Richard.

MS. KYZER: Richard. We're getting to know each other via the phone line. Richard, did you have a question?

Q Well, yeah, actually just now with the touch screen, I was wondering why are they going the inductive route instead of using the recent method that Jeff Han over at NYU discovered.

MR. RAUPP: Well, I'll totally confess that I don't know what the NYU method is off the top of the head. But for inductive, the reason we went inductive is you can put it behind the display. There's no -- there's no issue of diminishing the front-screen image quality by putting it in front of the display. And so it was a technology that was available and certainly effective.

We aren't necessarily looking for the absolute perfect solution at this stage in the game. We want to demonstrate that the technology can be integrated but as advanced technologies come along, we'll certainly be looking at them.

Q I mean, the great thing about Jeff Han's is that it's actually more low-tech and it provides multi-touch so that the screen itself, without reducing any image quality -- (inaudible) -- points at the same time of touch.

MR. RAUPP: Yeah, so the next question -- again, I'm not familiar with it -- would be what technology readiness level do we have here? So another key dimension of the center in the context that we're producing technology demonstrators to put in the hands of soldiers is we need to look at technology that's fairly far along towards commercialization and fairly high technology readiness level for it to be ready. So is it still in the lab? Has he got something that's demonstrated at a large scale? Can we acquire it? All those things are questions that we have to ask ourselves when look for demos.

Q Yeah. Right.

MR. RAUPP: Go ahead, David.

MR. MORTON: So -- yeah. And so the other aspect of, you know -- so we believe there will be a requirement, certainly in some applications, for touch in Army systems. Certainly in the commercial arena, there's going to be a requirement for touch.

So our central focus is to develop the display technology itself. And so, for instance, touch is an auxiliary technology which -- we need to demonstrate that it can be done with the technology we're developing, but we are not absolutely concerned with getting the absolute best touch technology that's being developed out there.

And certainly if, for instance, this person you're referencing came to us and said they'd like to work with us in getting their touch technology on flexible displays and seeing how it worked, certainly one of the big things about the way we run the center is, I think right now we (have ?) 21 industrial partners. We pull -- and we work with our partners to develop various aspects of the technology, and so certainly if someone had a touch technology they wanted to integrated with out flexible displays, we're open to working with them.

And the way we do that is, they basically become a partner in the center and help us do the development work. So in other words, in this case, they would look at what the touch technology they're actually working on is, and we would look at whether it would be possible to integrate it with the flexible display technology as it currently exists.

But again, the core piece of what the center is supposed to do is to develop the flexible display technology itself, look at are there materials issues, are there manufacturing issues, and address those issues, so that we can actually commercialize the technology. And then along with that, there's the secondary and just as important piece for us, showing to the Army users and the PMs what the technology is going to be effectively in three years, say, so that when they plan to develop -- in the development programs, they have an idea of what is going to be available in two to three years, and -- because if you wait for three years before you actually get something that's commercially available, then you got another three years out before you can actually insert it in Army systems. And so the goal is to do the demonstrators and demonstrate some level, for instance, of touch technology, so that the Army user will have an idea of what is going to be available in three years, so they can actually insert it into their program plans.

Q Well, great. I think you guys are doing a great job over there with the flex displays. I think you guys are right on the money about focusing on that.

MR. RAUPP: If I can just play off of some things David said because, I think, I left them out of my intro remarks, in the addressing of the issues of manufacturing materials, what we've developed here in our research park, at ASU, is a state of the art pilot line.

Really it's the only kind of environment where you could really address manufacturing and materials and designs for manufacturing issues. And this particular unique asset here in the U.S. is really something that the Army and our industry partners can access to drive this technology forward in a very powerful and compelling way.

MS. KYZER: Great.

(Name inaudible) -- did you have a question?

Q Yes. Hi. A couple of questions.

First, starting with, you made some comparisons between the flex displays that you have now, in terms of power consumption, and how that compares to the Kindle and existing OLED devices.

Can you go over those? Because I didn't totally get what you said there.

MR. RAUPP: Okay.

Well, actually the comparison was to what I would call the mainstream display technology, liquid crystal displays or LCDs.

Q Okay.

MR. RAUPP: I wasn't comparing to other OLEDs or reflectives, because there's really nothing different between ours and theirs in terms of power.

Q Okay.

MR. RAUPP: It's really a question of translating them over to flex.
Q Okay.

MR. RAUPP: But in terms of comparing the power usage in a fully reflective display, like the electrophoretic or the E Ink, to an LCD, it's at least a factor of 100 less power, one-one-hundredth or two orders of magnitude less power.

Q Okay.

MR. RAUPP: And then in terms of OLED, it really depends a little bit on the OLEDs themselves, as well as the usage, but probably a factor of two to three is typically what is quoted there, in terms of power savings.

Q Okay. All right.

My second question then is right in your -- David, in your opening statement, you talked about getting information to soldiers in ways you can't do right now. So can you give us a more detailed sort of -- elaborate on that point, how these displays will really help soldiers? And what kind of potential information applications do you see for them?

MR. MORTON: Okay.

So one of the main things we're discussing now is the rifleman in the field, getting him information that he needs to be aware of his surroundings.

Right now there's radios in the field. There's centralized -- there's controllers, but the individual rifleman doesn't have a lot of information.

And so one of the concepts that we're investigating is having a flexible wrist display, something that basically uses very little power, fits on the soldier's arm, that can provide him a map of where he is, where his friends are, where he needs to go, where the enemy is, perhaps update him with specific instructions on something -- on how to enter a building; in other words, a small, kind of four-inch display that uses very little power, has very little weight. If he has it on his wrist and bangs it into a wall or he's crawling on the ground, it will not break.

And so it's that kind of concept at the soldier level that we're thinking of, just providing him not -- just the information he needs. In other words, the rifleman doesn't need to have all kinds of information. He needs specific things at specific times that will help him do his job: a map, you know, again, friend or foe, which direction to go, you know, if he has a mission and they're trying to enter a building, some instructions on what he's going to see, perhaps a picture of what the building looks like that he's looking of for. Those types of applications we just don't do now, and it's difficult to have that situational awareness on the soldier without having a large, bulky, power-hungry device. And you just don't want the soldier to be carrying an extra five-pound brick around.

Q Okay. My final question, then, is in terms of commercialization. Again, in the opening statement, you talked about how the goal is supposed to be development of this -- (inaudible) -- and make it available for commercial manufacturing. How far are we from that commercial manufacturing process?

MR. MORTON: So, we expect -- depends who you want to believe. So the way the center deals with that, one of the -- the display -- the display industry is an international industry. And so the way we implemented the cooperative agreement with ASU allows us to work with companies, universities from anywhere in the world. And one of our recent partners that has joined the center is LG Displays, and they are major manufacturer of displays now. They actually provide a number of the liquid crystal displays that the Army uses in systems now.

And from our standpoint, the technology that we develop within the center, this provides a path for transition to a real manufacturer, because we want to go to a real manufacturer so they can make a lot of it, they can sell it commercially, and it's relatively inexpensive. We want to put a display on every soldier, you know. For us that's a lot of displays. It's not a lot of displays for a manufacturer, but we still need to get the cost down so we can actually give the soldier that technology.

Q Okay. And, you know, do you have some sort of timeline for this, where you're talking about -- I know you said you're showing them what -- you want to show them what will be available in two to three years. Is that still the timeframe you're looking at for this particular technology and display -- (inaudible)? Do you hope to have it out in the hand of soldiers in about two to three years?

MR. RAUPP: We expect to have fielding demonstrations in limited quantities in two to three years, yes. In other words, field -- we're going to be doing demonstrations between then and now. But if you're talking about having soldiers actually doing field travel -- trials with the technology, two to three years is where we expect to be with a number of devices, whatever they may be, in the field.

One of the places we're looking at doing that type of demonstration is through FCS (sp) with something called the centralized controllers. We just had a couple of days of discussion here with the FCS (sp) folks, that is an important avenue to get the technology into the field for us.

Q All right. Okay. Thank you.

MS. KYZER: Thank you. We will open it up to other questions. We do have a couple more minutes left. So are there any other questions out there?

Q Lindy, this is Brian again. I'll jump in if I can.

MS. KYZER: Yep. Go ahead.

Q Okay. Question for you. You were talking about basically what level of information that you're trying to push on this. You know, totally got it and totally agree. The question I had was, what system are you guys planning on this linking into? Is it going to be something that's linked into the current radio networks -- ASIP (sp) or EPARS (sp) or something like that? Or is it something that is going to more be shooting at the JITR (sp) system with FCS then?

MR. RAUPP: That's a system engineering question. (Laughs.)

And so, I mean -- you know, so whatever FCS -- whatever radio FCS ends up using to transmit the data around the battlefield is their decision. And from our standpoint, you know, for instance, the centralized controller -- the data is going to come in on the radio, whatever radio they're using, and our piece of that is helping them develop the actual interface, which includes the display. And so, you know, at some level -- I'm not qualified to answer that, and I think at some level it's not clear, and it's going to be system-dependent on which radio that you actually end up using.

You know, our piece is, you know, once the data comes in on the radio to the device, you know, what is that device, and how does it display the information for the soldier.

Q Okay. Got it. Just curious about that.

The very last question I had for you was, I know with some of the systems we have now, you know, when you're talking like MCS or MC2 or anything like that, that's in a company or battalion (talk ?) or above, you really don't have this issue. But when you get down towards like FBCB2 in a vehicle or Blue 4 in vehicle or something, it seems to be that as you're going through large amounts of map space and stuff like that, as you're scrolling and stuff like that, you start to have that lag type thing where blurs up -- we can blur up on the edges for a second, then it goes away second later sort of thing.

Are you guys seeing similar problems with this, or is it pretty much just rolling through data like it should be sort of thing?

MR. RAUPP: So the data -- I'm not specifically familiar with what you're -- the data blurring you're referring to.

So liquid crystal displays have kind of five to 10-millisecond response time in the device itself.

Q Okay.

MR. RAUPP: And so if you have extremely fast-moving images, you can get some blurring in liquid crystals. And you know, the manufacturers are working very hard on, you know, triple-scan liquid crystal displays to get rid of that problem, mainly for sports on television in the home market.

But I'm not sure if that's the issue you're talking about. In other words, it's -- if the data's coming up slow, you know, your display only can respond to the data it gets. So if the data is not being updated fast enough, then you'll get something. But I'm really not familiar with the actual problem you're talking about.

However, what I will say is the two technologies that we're dealing with, the E Ink technology -- in the lab, we've -- they have demonstrated 30 hertz video rate. So it's not -- it's more cartoon speed video they've demonstrated, and actually we believe that has certain applications, certain UAV kind of applications. The data's only coming back at 30 hertz, so we think it may have application for that.

The OLED technology that we're developing is very fast. Its response time is, again, a couple orders of magnitude at least faster than any of the liquid crystals that are out there now. So full motion video is not an issue for that technology.

Q That's awesome. Because that's exactly one of the other things I was thinking about was with the UAV feeds and everything -- you know, whether it's a Raven or a Predator or something else. So that's absolutely awesome.

Good deal. Thank you.

MR. RAUPP: And so just to follow up, we think -- you know, we're looking at two technologies and we think there's two technology spaces and it's not going to be one technology fits all.

Q Great. Awesome. Thank you guys so much.

MS. KYZER: Okay. If there aren't any other questions, we'll go ahead and -- do you have any closing remarks, Dr. Morton, or anyone else on the line?

MR. MORTON: The one -- the only closing remark I'd like to make here is, you know, we're talking about soldier applications and small controller applications initially. In the long term, as we go forward, we think that this technology will enable new things in vehicles. You can think of roll-up maps that go to a command post where you actually pull the map out of the tube the way we used to, but instead of being a paper map, it's an electronic display. What we will be able to do with the technology is just -- is only limited by what you can think of.

MR. RAUPP: David stole my thunder. That's exactly what I was going to say. (Laughter.)

But I think -- I think, you know, initially we think about what -- where could we insert the technology to replace the fragile bulky glass-based displays now. I think that's an obvious place to look. We're technologists. We think of those kind of things fairly readily, but I think what will happen is the product designers are going to get a tremendous design freedom from the fact

that they're no longer stuck with a glass fragile rectangular display. And literally they'll be able to put a display on any surface or a free-standing surface that could be unrolled.

So when you have that kind of design freedom, I do think they're going to come up with products that right now we're not smart enough to envision but eventually will come about. And when we talk about changing the way we view and access information, that's really what we're talking about.

MS. KYZER: Great. Well, thank you so much, General -- gentlemen, I really appreciate having you on the line. Thanks so much for the bloggers that dialed in. You can go ahead and get a copy of the transcript at defenselink.mil/blogger. This concludes the roundtable. Thank you everyone for participating.

MR. MORTON: We appreciate the opportunity here. Thanks, everybody.

Q Thank you.

Q Thank you, gentlemen.

END.