

## Human Factors Issues in Imagery Analysis Using UAVs Workshop

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Panel on Improving Human Imagery Analysis Performance

FACILITATOR: Dr. Nancy Cooke, CERl

### PANELISTS:

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Staff SGT Jonathan Hoehn, Ft. Huachuca

Dr. Jim Staszewski, Carnegie Mellon

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Commander Jeff Huddleston, NAVAIR 4.5X

### Notes:

Delcourt : Regarding experience with imagery, they take it for granted that soldiers can be good at imagery analysis. There is a lag. Because knowledge has to increase at an alarming rate. There are new soldiers coming in and for them the program is now broken down to help them get a fundamental understanding of the material. Students are taught size and shape of targets to ID them. The best operators are folks that take entire areas of ops and break it down into sectors, instead of trying to eat the whole pie in one bite. There are lots of external factors in Imagery Analysis - complacency is tough and lots of boredom that has to be fought. Thermal cross over is a problem when sun is coming up and or going down with eo/ir imagery. Most importantly, operators have no reference as to what they are looking for these days. They are learning on the fly—hardest way to learn and with no reference material. Battlefield changes everyday. How do you train in an asymmetrical conflict? They also try to fill in the gaps because what if they transition to a linear conflict? The best Imagery Analysts are the attentive people that can look at details of a picture - those are the best. It is very challenging to do training. There is little supervision in the shelter and soldiers are expected to go out and do their jobs. Very challenging. So training tries to be flexible but it's hard because the battlefield changes everyday.

Hoehn: He trains the beginning portion and what it means to be an operator. Focuses on search techniques and patterns to support the payload operator. Target ID, courses on BDA are important, focus on native behaviors. The absence of things is very important, just as important as something unusual being there. Importance is stressed on the fact that you are out there saving lives. Teach them about different types of intel. Passing it on is important. IR theory is important and taught to get weapons signatures. Working with manned aviation is taught i.e. guiding in an apache. Vehicle and target ID is taught. Teach different features of vehicles. Don't judge by one factor; look at different features. They teach using Russian equip since that what the enemy is using.

Cooke: Many factors are responsible for making this a tough job (IA) such as detection, interpretation, constant vigilance, UAV is moving, operator might be moving, mutli uav control, imagery poor quality, targets are smart, living, moving, adversarial, communication of imagery is challenging, asymmetric warfare challenges... what are the biggest challenges from these from a HF standpoint?

Ezzell: Most communication in AF is thru chat. The biggest challenge is learning the language of chat, learning abbreviations and all the abbreviations across the different mil branches. Chat is best across long distances.

Cooke: Do you communicate imagery thru chat?

Ezzell: We describe and share what we see. We can reposition the Sensor package based on what supported unit needs.

Huddleston: Complacency is the biggest - hours of boredom, with hours of sheer terror. But the terror today is taught because you might miss something that is supposed to cause you terror! Unless you have an ID'd target, it's easy. but when you don't know what you are looking for (i.e. patterns or activity), it's like watching hours of snow.. it's a challenge.. must focus attention. Continual sound is interesting.. may keep operators concentrating and focusing.. makes it irritating because its constant.. he wonders how it would be if the noise were administered over short periods of time.

Ezzell concurs—in Afghanistan people carry shovels over shoulder, which are mistaken a lot for RPGs. Have to pay attention to where the people are and what the people are doing. Operators have got to be alert. Exploiters have often had to retract.

Delcourt—TTPS change. Thermal differences in road showing dirt.. and its counteracted.. next week the enemy won't do that. So for SOs events change so fast.. enemy countermeasure are so fast.

Comment: V. Billock - subject operators to noise is good, but it has to be varied and not monotonous.

Q-Are you allowed to put on earphones and listen to music?

All: NO, then you can't hear command, etc.

Asker maintains piping music led to increased performance.

Jay Shively: Sound as a stressor is crazy talk! Noise is a stressor; it reduces attention - not a good plan! Maybe Yerkes-Dodson law comes into play, but you can't cause more stress to keep them awake.

Comment: In training, locomotive engineers had long boring job. They had to hit a button at certain times to keep them awake. It's a part of every train engine.

Hunn: Similar research has been done in the haptic channel, but there is a risk to attenuation over time.

Q-for Staszewski—What is your assessment to the potential of CTA and training imagery analysis?

Staszewski: Good potential there. People act as filters. There is lots of literature in expertise, less load for experts looking for patterns rather than pieces of info. These operators have the same abilities as most do during discrimination tasks. Experts focus on discriminating features. Issue is how principles of expertise figure into specific context of imagery. We have the tools to describe.

Cooke: Do we know that some individuals better are better at this than others? Are there experts?

Hoehn: I would say that some pick it up quicker than others.. the reason some don't do as well is that they aren't used to looking at things they way the Army wanted them to. Comes down to practice.

Delcourt: They look at things in 3-d and then forced to look at 2-d... it's a whole different way of seeing. Some are better because they want to be better at it. They think the way you are teaching them and they don't fight the training. Those people do better. There is an instructor that has been doing it for a long time...you can see how students listen to him and judge how they will perform.

Cooke: What about real expertise? Is there someone you can identify and say "I want that person!"

Delcourt: At what stage of training? The best people are the ones that take work home, practice and study.

Huddleston: Is it learned or inherited?

Delcourt: Yes, they have to learn and keep an open mind and not draw conclusions. They are good and yes it's learned.

Ezzell: You can't screen this in the ASVAB.

Huddleston: It's just like how some people can see better spatially and some can't. I can do the stereograms...

Cooke: Can you describe the experts in landmine detection?

Staszewski: word of mouth.. asking around who was the best at what they did. Then ask them to participate.

Q- Did he know why it worked?

Staszewski: No, when they saw the diagrams the experts thought they made sense.. but bad thing about expertise.. it's hard for him to interrogate his knowledge base. Can it be done? Yes. But it is tough. They have to adjust what they think they know based on outside feedback they get. Most people can't deal with their knowledge holistically.. chop it up.. it's a limitation. Expertise in military is hard earned.. too bad units are stripped of it due to rotation, retirement.. etc.. so they need to multiply and keep the expertise.

Q-should it be possible to extend the expertise?

Staszewski: Sure.. different experts may have different strategies.. if you can find one that really boosts performance, and if you find another, test it.. but do it w/o compromising being quick to get the tech out there.

Q—are you satisfied with the images you get? Could it be better?

Ezzell-I'd always like to get better images.. U2 is being retired.

Q-What would make it better?

Hoehn: for the small systems, imagery is shaky due to movement.. geostabilization would be good.

Q-sharpness and clarity isn't always possible

Hoehn: I'd like the best image possible, but there are other factors that play into it

Ezzell: There are a lot of environmental effects that affect imagery. We have to do the best we can. Thermal crossover affects us as well.

Cooke: Any stories of greatness or failure due to image quality?

Hoehn: Thermal crossover again. (reiterates what it is) If you are flying a night mission using IR, and temp changes, you can't see.

Ezzell: Tough when you are chasing a car.

Q—How disorienting is it to look at lower limits?

Delcourt: AVO should be good to keep you out of lower limits at all times. Except during watching a convoy and you get ahead of it.

Ezzell: with predator—it has a target mode. Goes 105 degrees and holds it there.

Cooke: About different technologies and design aids form improving imagery analysis—recursive movement, over should views, birds eye views, training and selection, image transmission, haptic/aud feedback, PiP, are all solutions. What do you think are the low hanging fruit here?

Ezzell: need to teach the imagery analyst to think.. teach them to ask the right questions. Currently they don't ask the right questions. Complacency has to be fought.

Delcourt: Over the shoulder view? One good thing about soldiers is that they don't have any prior experience. They get in the shelter and learn what to do, so they get taught not needing the over-the-should view.. or behind the UAS camera angle. They have it on the map, and instruments—no other bells and whistles. They did the shelter right.

Huddleston: You've got a FOV picture, is that a help?

Delcourt: yes, if you get lower limits, you can get back to what you are looking at real quick.. you know exactly what you were looking at. Little icons mark where you searched and you can go through those to see where you looked

Huddleston: Does it have a projection of video to give you an oblique view of the FOV cone with real to life video?

Delcourt: We don't have that on the smaller UAVs, we have the 2-d views which can be frozen.. no superimposed video imagery.

Comment – Staszewski: Statement about thinking critically about imagery-what Ezzell is saying makes perfect sense.. consistent with expertise.. when experts relate meaningful features, they form patterns. Commit them to Long Term Memory. It reduces WM load and increased WM capacity. Experienced analyst will be more efficient. Another advantage of thinking critically is that knowledge is more easily retained. Experts make meaning of the things they encounter. They reduce the complexity.

Ezzell: Anybody that is really good never stops learning. You have to keep up on reading and current events, that's what will make you good.

Staszewski: The fact that it requires lots of practice and work—is understated. Where does the motivation come from? Early success perhaps provides motivation.

Huddleston: He encourages researchers and designers to talk with the operators. Continue this because it's critical to understand what the operators have to go thru. Or else we won't be any help to them.

Hunn: From a design standpoint, must bear in mind that you need to free up cognitive load and automate as much as you can the non-cognitive duties, the tedious stuff to make them more efficient.