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U.S. Army Research Laboratory

Human Research & Engineering Directorate

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

MANPRINT Practitioners Workshop

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Challenges and Opportunities for MANPRINT Evaluations in Rapidly Developing Systems

Traditional MANPRINT assessments often involved major weapons systems, created and developed over long periods of time.

However, the current Operations Tempo has created a need for rapid reaction responses, on COTS and Rapid Deployment Initiative Systems.

The boundaries between DT&E and OT&E are blurred in many of these operationally critical systems.

Most importantly, MANPRINT has never been more necessary, when: time is short, the need is great, and the pressure is high to field systems.

Challenges:

- Contractor owned systems and system management (pre-government acceptance)
- Time pressures, (one day, one week test periods, minimal test events)
- Developmental uncertainty (moving baseline configuration)
- Shortage of “real operators” or “real users”
- COTs works in commercial world, why would it not work in the DOD world?
- Political pressures associated with quick turn products “get it done!”

Opportunities:

- Contractors want to please customers, that is a lever for action to occur
- Short test time periods also remove inertial process development lags
- Moving baselines create flexibility in design
- Government expertise may be used to substitute for actual user input and COTs may be more responsive to enhancement than long term, deeply entrenched designs
- Flexibility is also associated with innovation and innovation may rapidly solve “unsolvable” problems by thinking outside the box

Collaboration Partners

Government

- **USAICoE**
- **UASTB**
- **IEWTD**
- **EPG/ATEC**
- YPG
- Army Research Institute
- US Air Force Research Lab
- Department of Homeland Security
- JIEDDO

Industry

- Battelle
- MITRE
- Northrop Grumman
- Boeing
- Lockheed Martin

Academia

- Massachusetts Institute of Technology
- Carnegie Mellon University
- Johns Hopkins University
- Arizona State University
- Miami University (Ohio)
- Brigham Young University (Utah)
- Lincoln University (Missouri)
- University of Central Florida
- Ben-Gurion University

MANPRINT Examples:

Models of Geo-Intel, Intel Fusion **(USAICoE)**

ERMP Manning UAS Program Office

Ground Master Radar (**EPG**)

Phraselator (**ATEC-IEWTD**)

Harnessing IED detection expertise (**UASTB**)

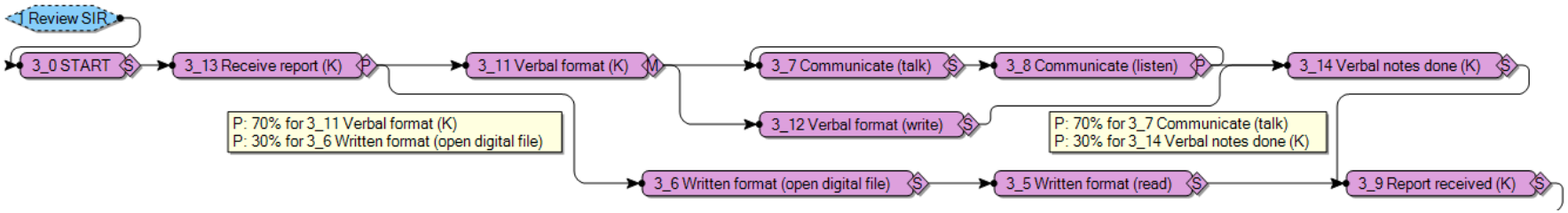
CIED work (YPG)
Crew 3.3, Duke V3, Hotshot, CVRJ

SBI*net* - Secure Border Initiative (DHS)
"Virtual Border Fence Program"

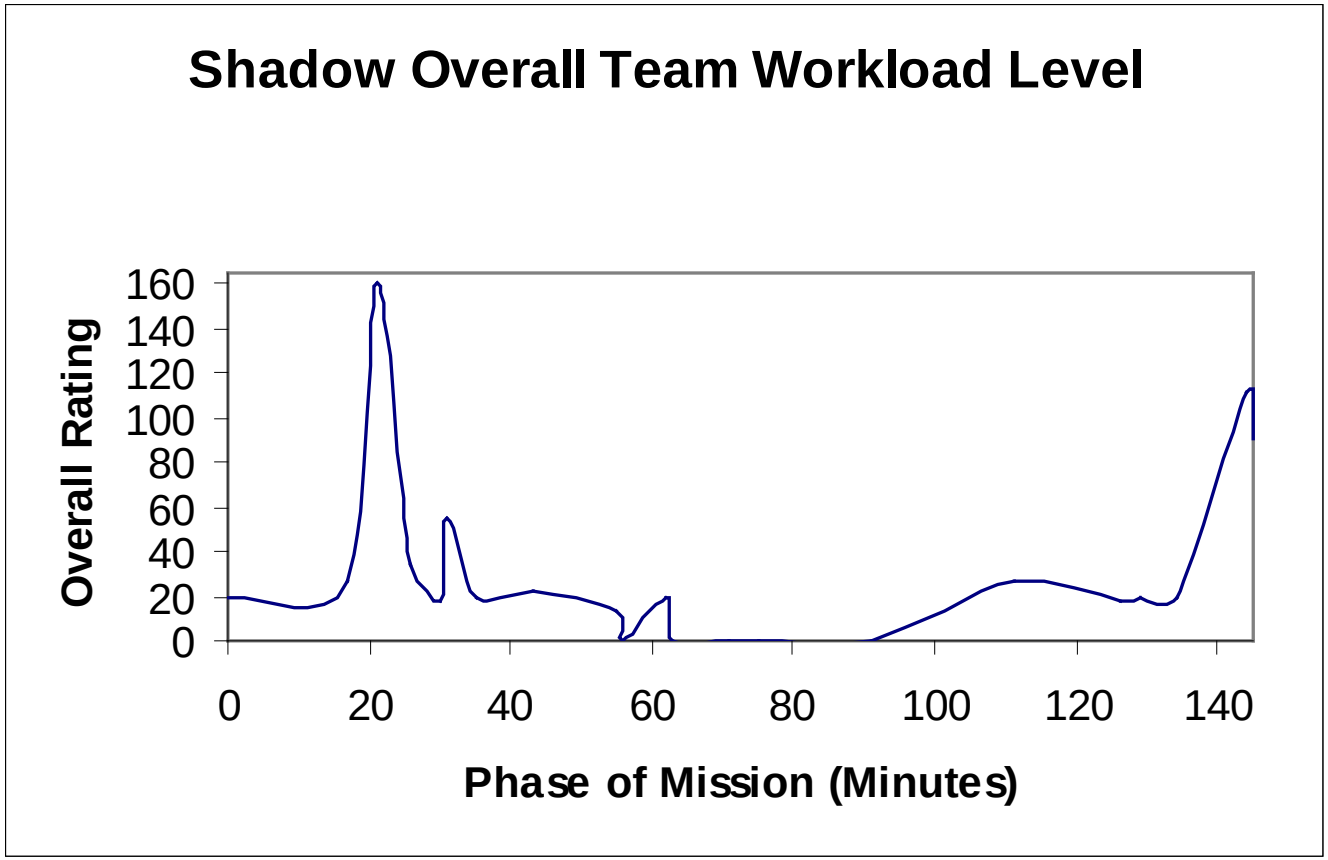
Sentinel Hawk (ARL-AFRL)
Multiple UAS, command & control

ACT-R Network Science of Decision Making Modeling (ARI)

MANPRINT : Modeling



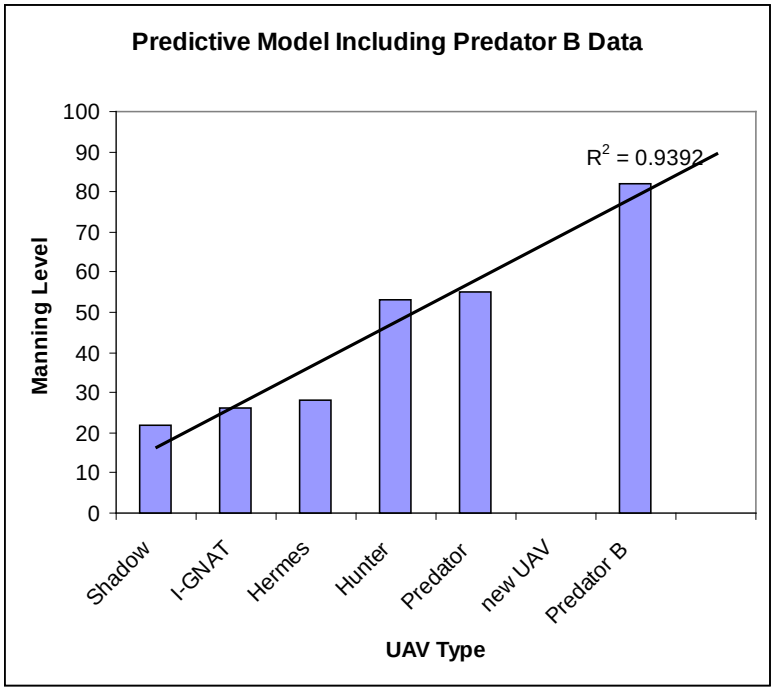
UAS Crew workload mitigation

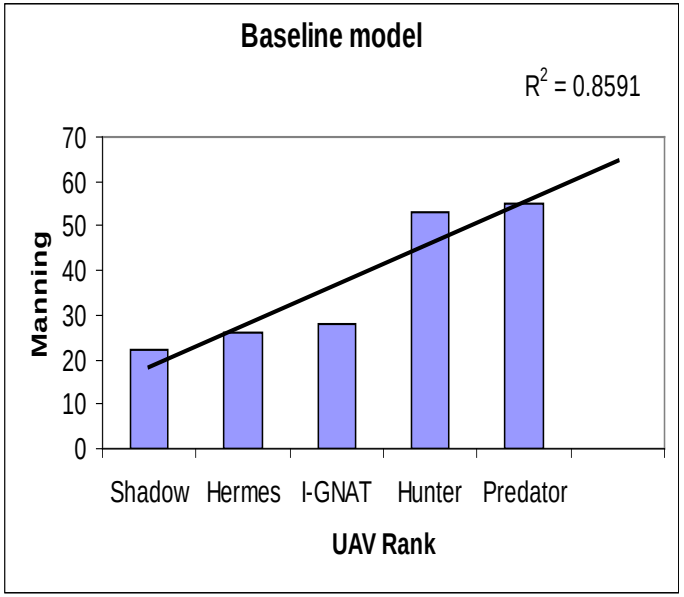


ERMP Manning

- Use comparable UAS systems to show trends in manning levels across DOD and other agency's platforms, extrapolate to a proposed system using numerous criterion variable regression models

- Manning Estimation: Show the system manning trends across UAS to predict manning for ERMP: Impact, ERMP manning level set by "Big Army" at suggested level





MANPRINT : Ground Master Radar, Phraselator P2, UASTB Research

Ground Master Radar,
Human Engineering Study

Phraselator P2, Human
Engineering Study

UASTB Research, Harnessing
IED detection Expertise

CIED program

Program name _____ _____

System: Counter IED Jamming

MANPRINT assessment 2009

MANPRINT Conclusions:

All elements of MANPRINT positive, and ready-to-field except for a critical Human Engineering flaw: Grounding Rod emplacement

Issue: 12 foot long, two piece steel grounding rod, to be driven by sledge hammer into the ground by hand

Problems: Two man team physical exhaustion after 30-45 minutes of hammering. Rod coupling threads damaged. No place to stand to drive 6 foot tall rod. Serious injury potential of missed hammer strikes

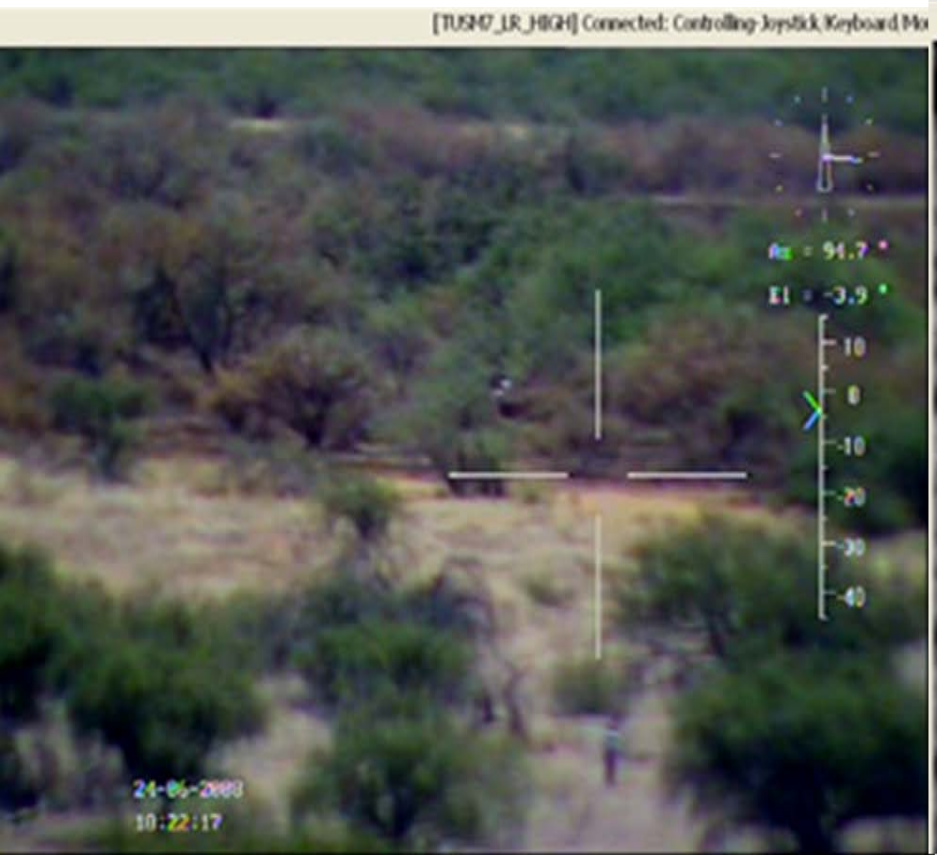
Solution: Use off the shelf grounding grid system employed on other GFE electronic systems

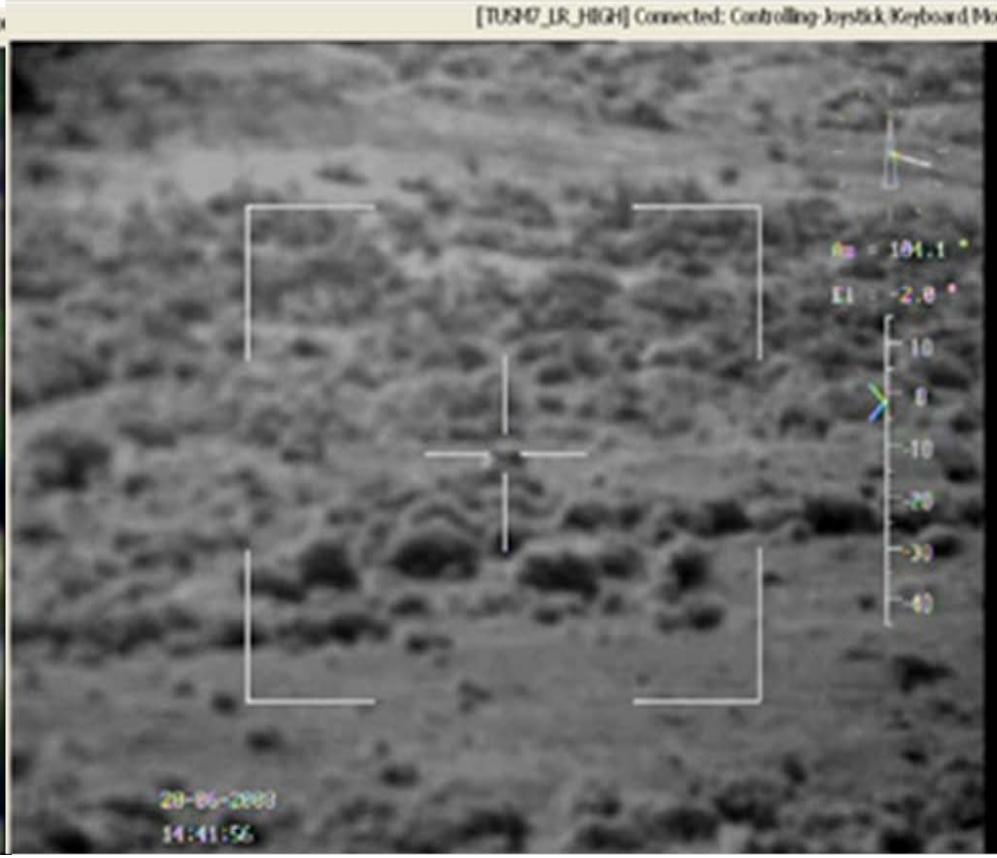
SBInet, DHS, P28 Program

- Mobile Data terminal
- MANPRINT Conclusions: Unacceptable Survivability Risk, and Safety Risk. System removed

SBInet, DHS, P28 Program

- MANPRINT, HFE, Visual Analysis showed serious imagery degradation, compromising, identification and classification of targets in the field.





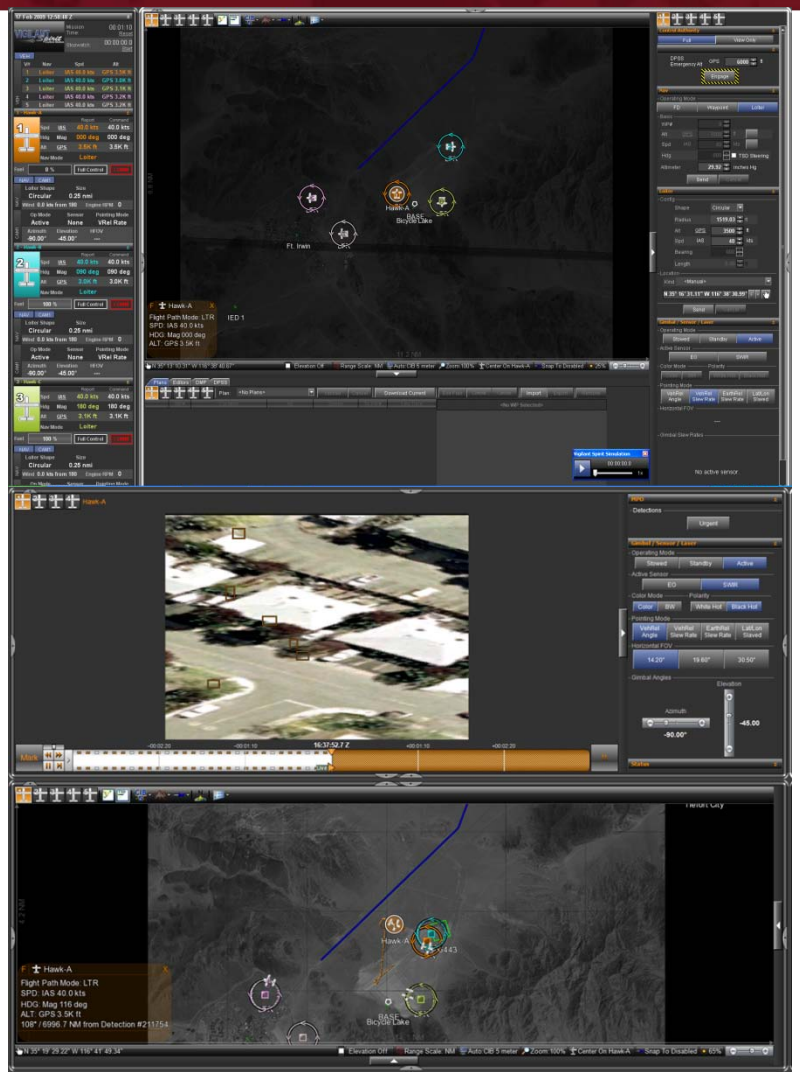
Sentinel Hawk System

Multiple UAS Command and Control Station

Automated multi-ship flight formation

Nice interface design, excellent user acceptance

Minor problem area: The ability to fly an automated formation of aircraft into a mountain was not designed out of the system!



ACT-R Network Science of Decision Making

- Research on Human-Robotic team decision making (ARI/ARL)

- Determination of mental models and their human/machine interactions with Robotic systems to detect IED's or enemy personnel

- MANPRINT could provide a structured approach outline to help focus this type of research

MANPRINT in Rapidly Developing Systems

- MANPRINT Practitioners have the opportunity to interact with systems as they are being developed, or even in early research stages before high level system design and process inertia is created

- MANPRINT practitioners have the ability to greatly influence developing systems because they may be the first and only influence on the domains of MANPRINT for that system

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