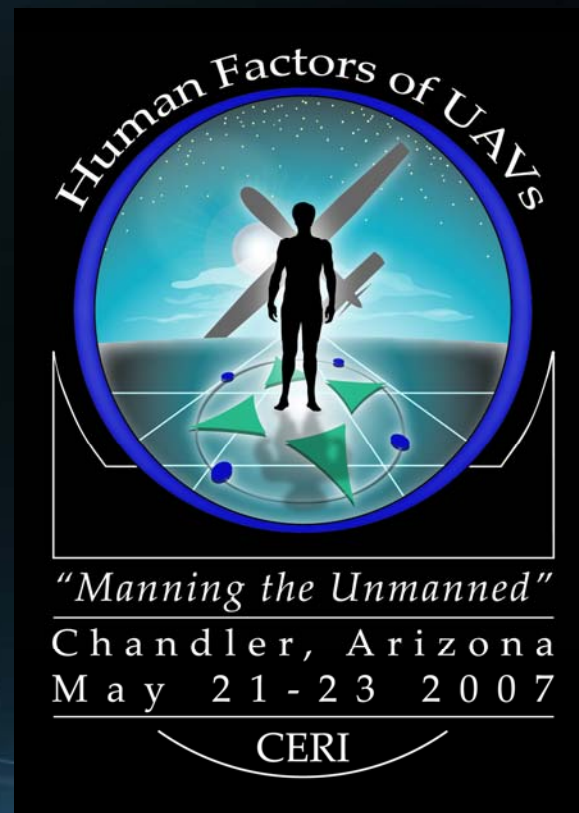


# Closing Comments

## Human Factors of UAVs: "Manning the Unmanned"

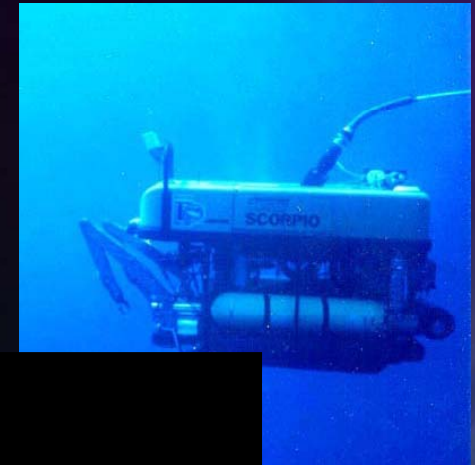


# *Broadening our Scope*



Figure 7-1.

Ground and Underwater Vehicles



*Imagery Analysis  
Integrated Layered System  
Eyes in the Sky*

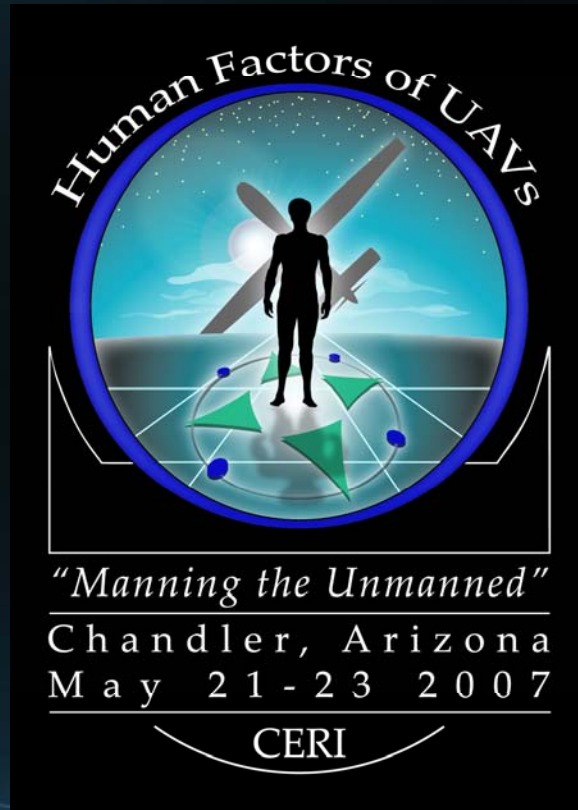


Border Security



# Highlights and Themes

## Human Factors of UAVs: "Manning the Unmanned"



# Human Factors Contributions

## Automation

- Comfortably giving up control to technology
  - By issuing plays
  - By going faster
- Taking control from incapacitated pilots

# Human Factors Contributions

## Multiple UAV Control

"a horrible idea"

- Better integration of humans and automation
  - Through interface design
  - Through understanding human capabilities and limitations
  - Through levels of automation

# Human Factors Contributions

## Crew Coordination

→ Improving coordination

- Within the GCS and ...
- Between the GCS and those on the outside (ATC, AOC)

# Human Factors Contributions

## Training and Selection

### → Systematic Analysis

- Training programs
- UAS tasks for medical certification
- UAS mishaps
- The role of spatial abilities
- The role of fatigue

### → With implications for training and selection

# Human Factors Contributions

## Simulators and Interfaces

- Interface design for improved imagery analysis
- Use of synthetic test beds
- Effects of different controllers (mouse, game controller)
- No. camera views
- Spatiotemporal scope of automation
- Multimodal interfaces



# Objectives

- Improved system effectiveness
- Enhanced situation awareness
- Improved safety

# Research Opportunities

- Individual and team performance metrics for simulation and operations
- Improving imagery analysis tools
- Crew communication and coordination
- Interface issues (5 ways to change altitude) and menus of menus
- Impact of video game skills on performance

# Most Popular Photos



# Top Quotes of Workshop

Maj. Martin:

“Without a layered system you will not be able to monitor the entire border through your soda straw.”

# Top Quotes of Workshop

Maj. Martin:

“Landing the Predator is the hardest aviation challenge I’ve ever had.”

# Top Quotes of Workshop

Goldy:

“It is not about manned versus unmanned, but it is all about integration. What are the tools that you bring to the fight?”

# Top Quotes of Workshop

1SGT Pezzatta:

“Commanders are hooked on UAV Crack.”

# Top Quotes of Workshop

Maj. Tvaryanas:

“This is my opinion and I’m speaking from my terminal rank.”



# Top Quotes of Workshop

1SGT Pezzatta:

“There is no 911 for the UAV operator. Communications to the ground needs to be improved.”

“I was UAV before UAV was cool.”

# Top Quotes of Workshop

Goldy:

“Where is the human factors engineer in system development?”

Marshak:

“General Atomics is about to hire its first human factors engineer.”

# Going Forward

- **Communications**
  - **Other workshops**
  - **Publications**
- **Next workshop**
- **Other?**



# CERI would like to thank the sponsors of the 4<sup>th</sup> annual Human Factors of UAVs workshop



# Hosted by the Cognitive Engineering Research Institute



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Mesa, AZ



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# Opportunities at the Cognitive Engineering Research Institute

- Post-doctorate positions
- Visiting graduate student research positions
- Visiting faculty
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- Collaborative opportunities
- Women in Science Program

# Thanks to Workshop Organizing and Support Team

*Harry Pedersen*

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*Amanda Taylor*

*Jasmine Duran*

*Leah Rowe*

*Jason Lancaster*

*Pat Fitzgerald*

*Bruce Liddil*

# Thanks to Participating UAS Operators



**Thanks to YOU,  
the Workshop  
Participants**

# Next up...

**ASTM International F38 Meeting on Unmanned Aircraft Systems**

**May 24-25**

*Development of standards for safety and performance ...*

*Facilitating worldwide access to commercial airspace ...*



*Please complete the workshop survey!*

*Have a safe trip home!*