NDIA
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Unmanned Vehicle Synthetic Environment

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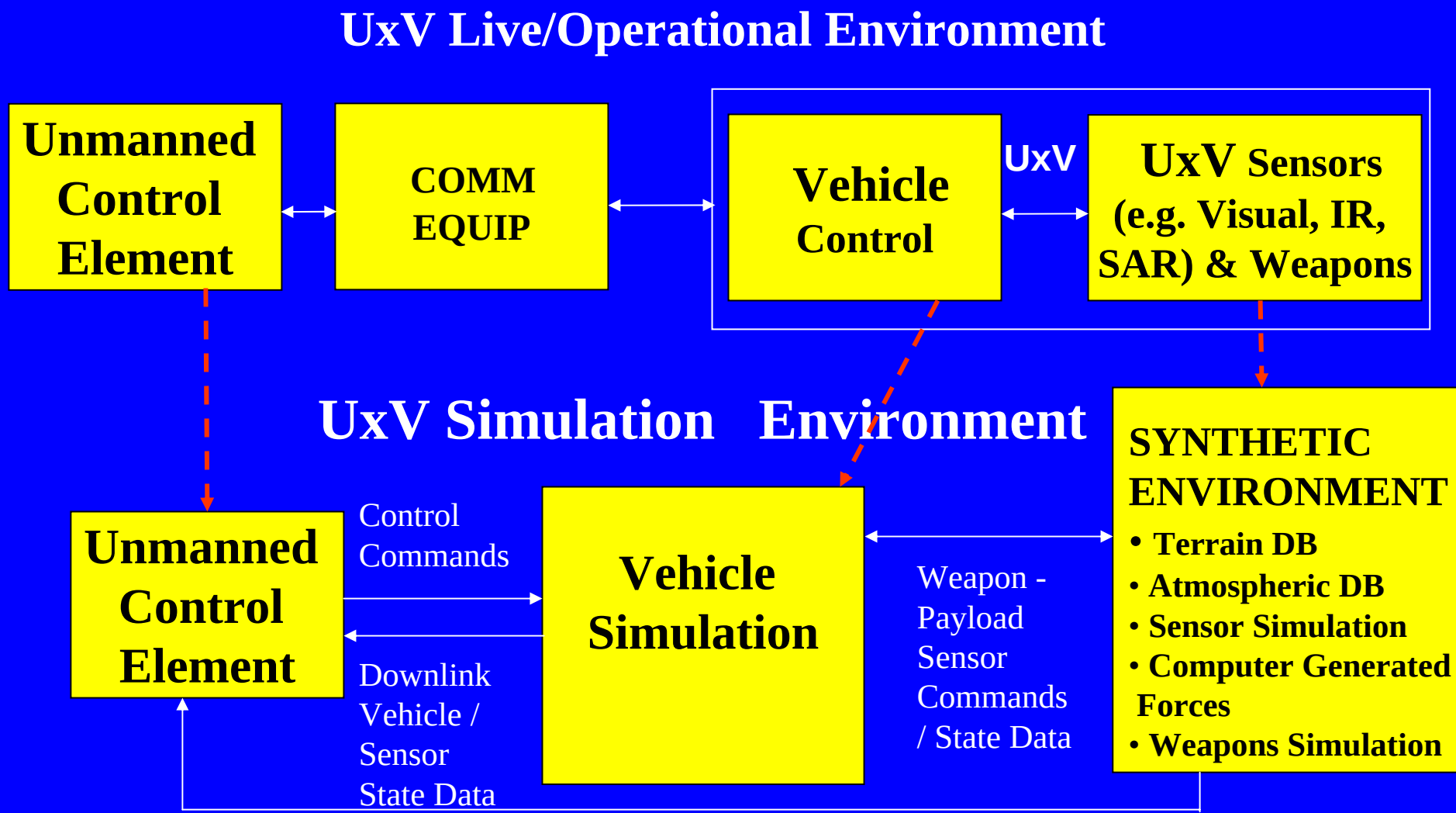
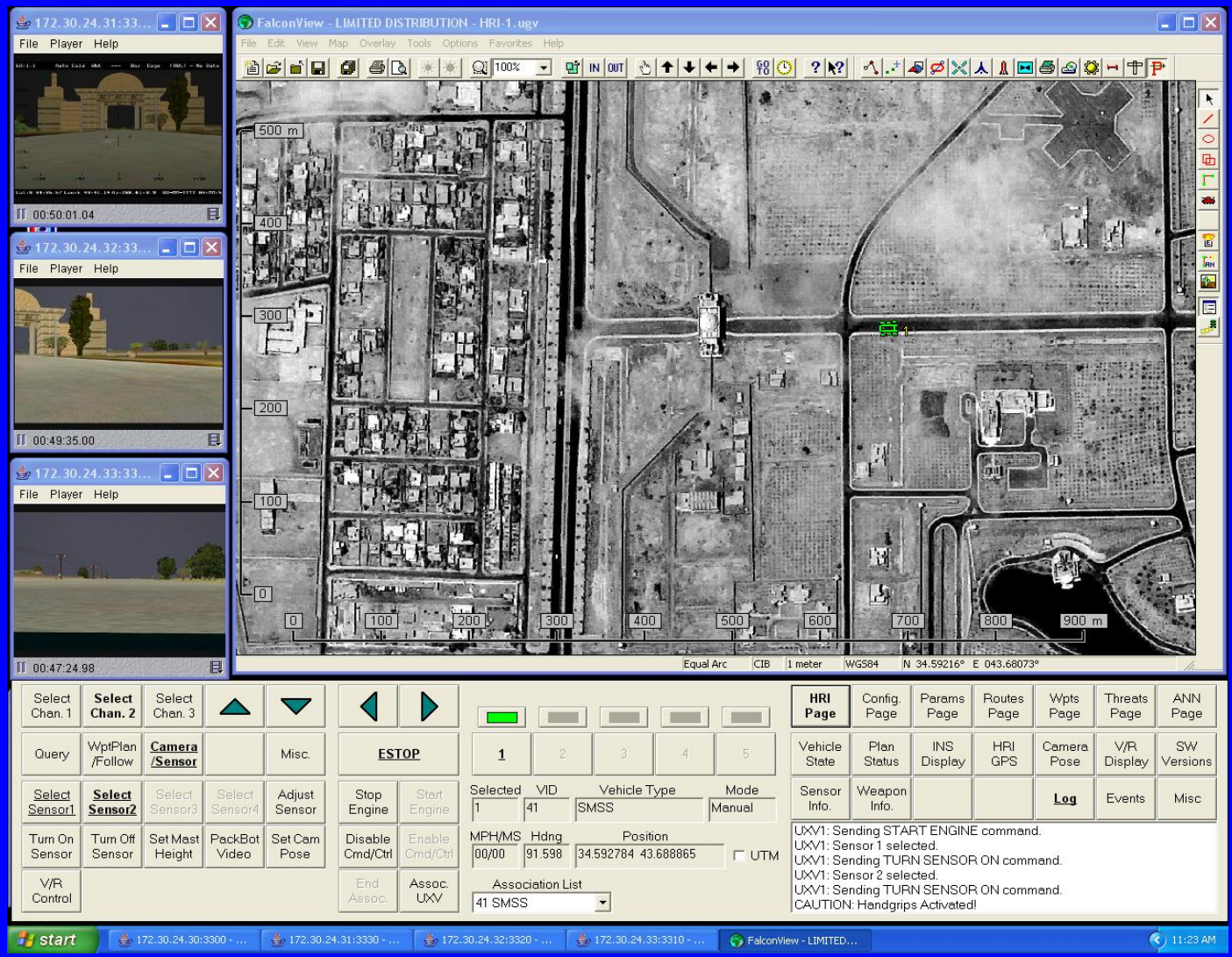
Introduction

- **Description of an Unmanned Synthetic Environment**
  - **Operational vs. Simulation Architecture**
- **Example Control Elements**
- **Video Examples of Real-time Sensor Images**
- **When a UxV Synthetic Environment (SE) could be used**
- **Corporate Research and Development Efforts**
  - **Unmanned Ground Vehicle Technology Transformation Program (TTP)**
  - **Fast Inshore Attack Craft (TTP)**
- **Conclusion**

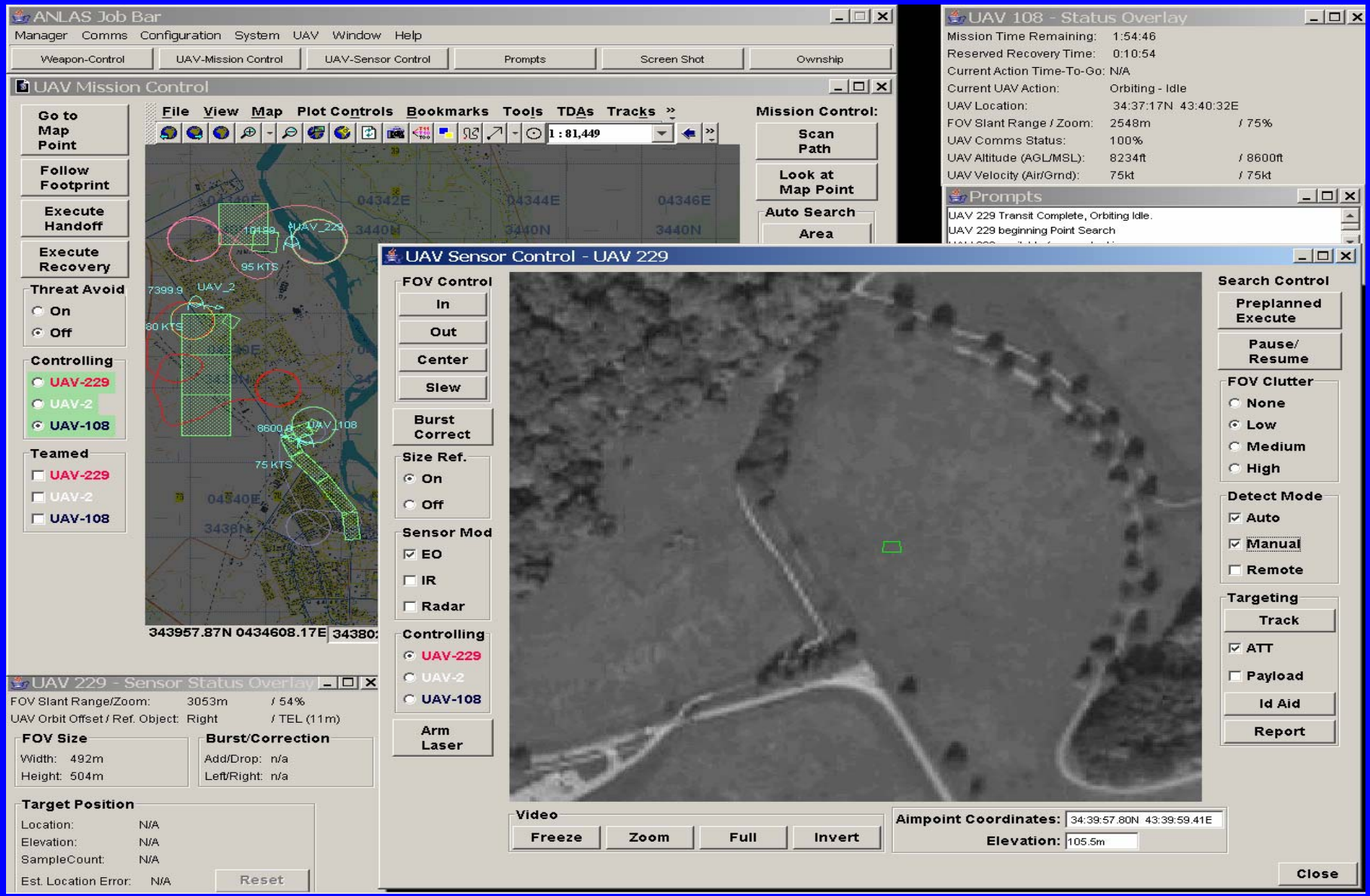
UxV Architectures



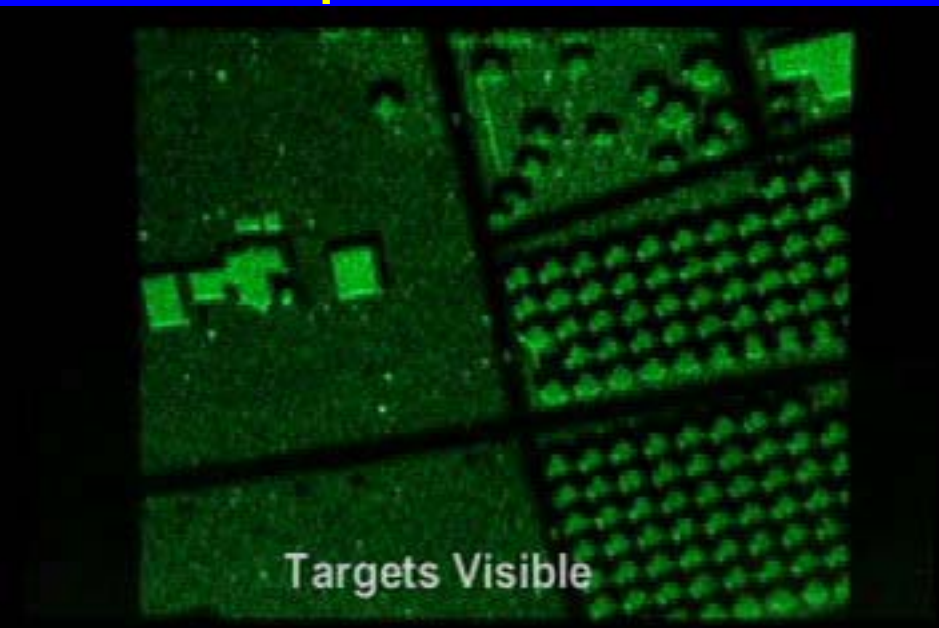
Example Control Element: Universal Controller Prototype (UCP)



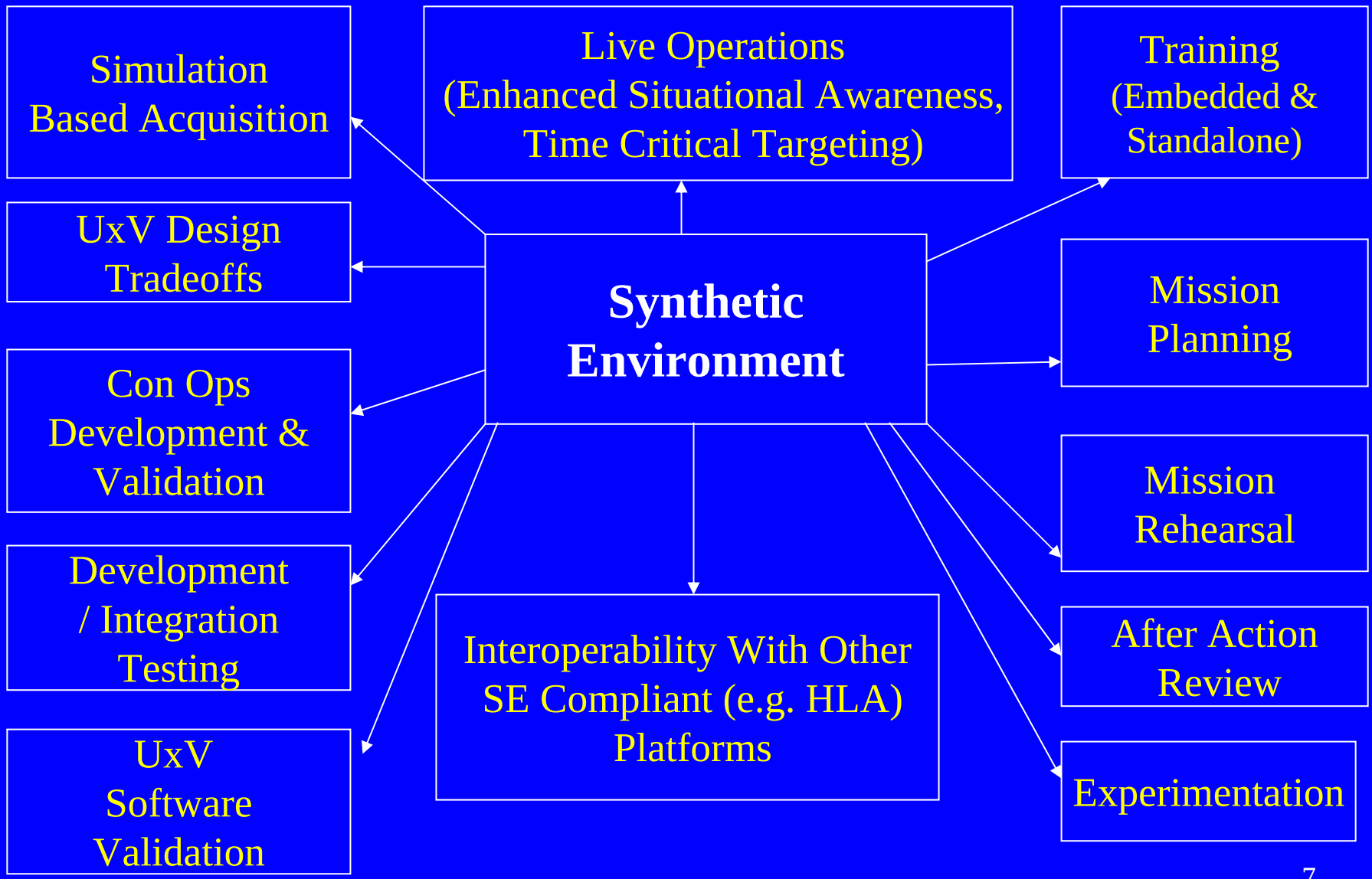
Example Control Element:
Generic Unmanned-Vehicle Supervisory Segment (GUSS)



Video Example of UxV Sensor Simulation



When a UxV Synthetic Environment (SE) could be Used



Corporate IR&Ds

Unmanned Ground Vehicle Technology Transformation Program (TTP)

Objectives:

- Develop an Unmanned Vehicle (UxV) Simulation Test-bed to evaluate the impact of unmanned systems on combat effectiveness, lethality and survivability of the platoon
- Provide Tool for deriving unmanned systems requirements, CONOPS, and Tactics Techniques and Procedures
- Simulate a Light Infantry Platoon conducting operations in complex urban scenarios

Key ideas to examine:

- "Rules"/Logic For Multi-vehicle/Multi-controller Use
- Autonomy, Situation Awareness, Collaboration & Role De-confliction
- Control Hand-off At The Unit Level
- Element "Out Of Fight" Taking control Of Unmanned Systems

Synthetic Environment Includes:

- 4 Simulated Video Channels: Multi-vehicle, Dynamically Selectable
- "Build-a-Bot", Scalable, Unmanned Vehicle Simulation (UGV and VTOL UAV)
- Universal Controller Prototype with simultaneous control of multiple types of UxVs
- Joint Semi-Automated Forces (JSAF) for Manned Ground Vehicle and Dismounted Infantry Simulation

Unmanned Vehicle (UxV) Simulation Test-bed

Demonstration System Layout

Unmanned Vehicle (UxV) Simulation Test-bed

Controller and Stealth Displays

Unmanned Vehicles (UxV) Simulation Test-bed

Live Vehicle Static Displays

Unmanned Vehicle (UxV) Simulation Test-bed

Live Vehicle Static Displays

Unmanned Vehicle (UxV) Simulation Test-bed

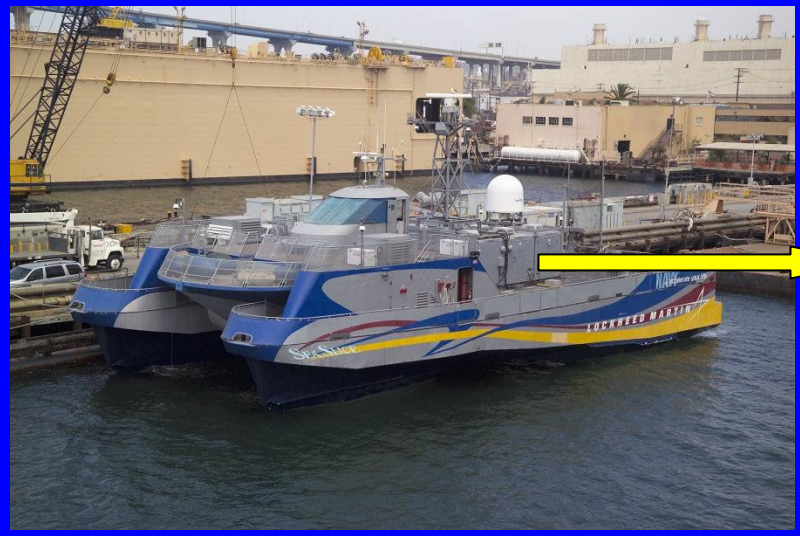
Customer Demonstrations

Corporate IR&Ds (Cont)

Fast Inshore Attack Craft (FIAC) TTP

- Experimental platform used to demonstrate ship protection within 5 NM radius
- Uses LM Sea Slice vessel, Hellfire Missiles, Radar, EO/IR sensors and UAVs
- Live and simulated experiment performed on Sea Slice vessel operating in vicinity of Channel Islands and San Diego
- Synthetic Environment includes:
  - Embedded simulation capability – 10 simulated video channels
  - Santa Cruz / Santa Rosa Channel Islands / San Diego coastline DBs for exercise area
  - Radar Track and sensor simulation provided to onboard C4I devices
  - Hellfire simulation
  - Joint Semi-Automated Forces (JSAF) used to generate naval insurgent attack scenarios

Operational Simulation & Visualization



Simulation Capabilities

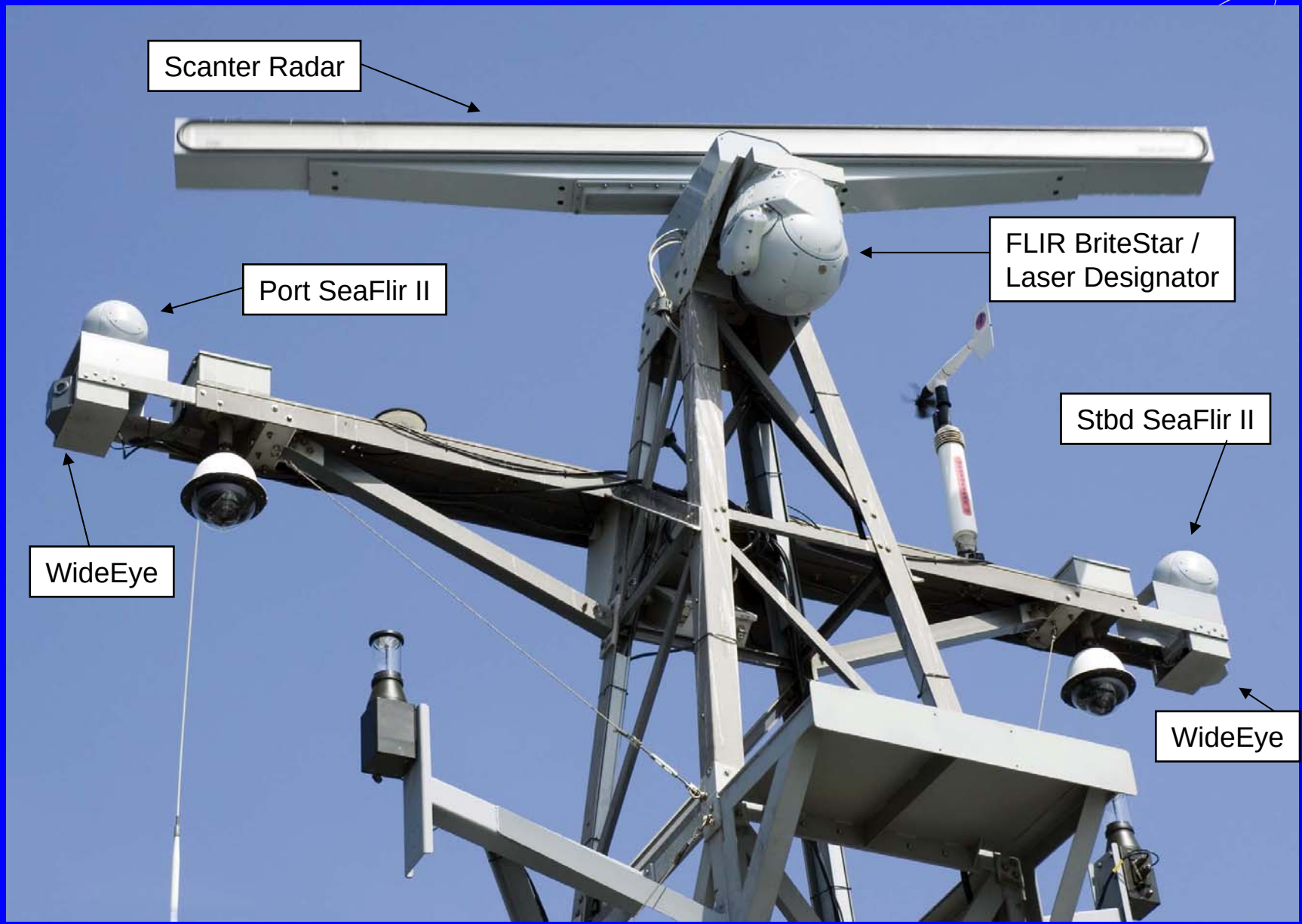
- Full Fidelity Synthetic Environment
  - Natural representation of geo-specific operating areas
- Robust Semi-Automated Computer Generated Forces (CGF)
  - Hostile target boats, friendly and neutral clutter
  - Scenario Generation functionality
- Real-time Sensor Simulation
  - EO, IR, and Radar simulation at Combat Management Operator stations
- Realistic Weapons Engagement
  - Hellfire fly-out and engagement of CGF
- Embedded in Tactical Systems
  - Distributed environment driving situational awareness at each operator station

Operational Value

- Initial Team Training through Mission Rehearsal
- Concept Development and Experimentation
- Tactics and Doctrine Development

Sea Slice Dockside

Sea Slice Mast Sensors



Simulated Attack

UAV Capture

Hellfire Launch Pedestal

Conclusion

- Transparency in HMI operations whether performing live or in simulation is the goal
- Embedded simulation provides extremely cost effective method to maintain team readiness
  - Required only 15 minutes on Sea Slice to transition from simulated to live operations
  - Enables disparate C4I devices to operate collectively on same Training and Mission Rehearsal scenarios
- A representative suite of equipment incorporating the described capabilities has been brought to the conference. The UxV configuration is available for demonstration and further discussion in the NDIA Display area. Please feel free to stop by.