NEW IDEA: Design to Mission

• Need Mission Effectiveness Estimates
  – Realistic Mission Training Simulations – Lightweight, so Flexible
  – Mission Success Metrics – performance metrics support
  – Calibrated Using Experts in the Loop
  – Integrated, Joint, Coalition

• Enable Exploration of Large Design Space
  – Hardware, Software, Human Elements – baseline and notional
  – Broadly Available to Industry – e.g. Networked PCs
  – Flexible – i.e. Modest Fidelity

• Gain Confidence in Capability Based Assessments
  – Operator CONOPS and TTPs
  – Trade Space Analyses within Mission
Synthetic Environments for Assessment

Acquisition ↔ Training ↔ Operations

Synthetic Environments

- Platform KPPs
- Hardware Sub-systems
- Human View
- Software, Automation
- CONOPS TTPs

Bottom Line: SEAs Implement Top-Down Value Estimation

Distribution statement A. Approved for public release; distribution is unlimited.
The Design Space

For many domains of interest, requirements shift too fast for the conventional “research, design, build, test” cycle of acquisition
– What is the impact of new capability “x” on mission, training, team performance, etc?
– Given new mission profile “y,” what new capabilities are required for team to meet effectiveness standards?
– What are improved CONOPS and TTPs?

This is what Simulation Based Acquisition hasn’t solved...
but Synthetic Environments for Assessment offer hope
– SEA allows interoperable models to be reconfigured in infinitely many ways to test hypotheses about effectiveness
– SEA is not a “system” that you plug models into (like SAF)
– SEA facilitates validated collections of models that provide calibrated simulations for testing new ideas and concepts.
Proposed Criteria for SEA

- Simulation in Form, but Fidelity Traded for Flexible Experimental Use
- Support Multiple Task Scenarios within the Environment, functionally equivalent to Operational Tasks
- Scenarios linked to Naval Mission Effectiveness Metrics
- Calibrated Metrics Using Naval Operators
- Distributed to Broad Science and Technology Community

Enable an Engineering Approach to Unified System Design, Training, and Operation.
Description:

- Technologies for High Fidelity, Multi-mission, Integrated Distributed Training and Experimentation.
  - Realistic Synthetic Entities, Environment, and Mission Scenarios
  - High Fidelity Integrated Mission Training Facility, Ford Island HI
  - Models and Analysis of A2AD Tactical Behaviors

Naval Need:

- Ability to Train to System-of-Systems Missions
  - Fully Automated, Realistic Synthetic Forces (LVC)
  - Carrier Air Wing Mission Rehearsal (LVC)
  - Automated Scenario Generation (UAS Training)
  - Realistic Synthetic Environments – EW (EDUCAT2E)
  - Missions: FAC/FIAC, ASW, ASuW, MIW, NIFC-CA, EW, A2AD, OTH-Strike

FY14 Accomplishments:

- NIFC-CA entity behaviors to a Navy Common Training System (NGTS)
- FIST2FAC bi-coastal FST demo (PACFLT and LANTFLT) of synthetic A2AD event

Impact:

- Enhanced Fleet Readiness and Resilience
- Synthetic Environment for Assessment of CONOPs, TTPs, and potential ROI on weapon system acquisitions
The smart buyer problem:

How to select design elements for leap-ahead capability improvements without buying everything of value?

• Is there some metric applicable to all technology disciplines?
## Interface Designs

Create a Synthetic Environment with realistic mission scenarios for:

- Building calibrated Mission System Trainer
- Evaluating various interface designs
- Testing Operator Candidates

✓ TTA with Common Control System (PMA-281)

## Personnel Selection & Assignment

Deliver selection test components for Navy unmanned aviation operators

- Identify skills unique to UAS operators
- Understand training trade-offs
  - Implication of different missions & operators (officer vs enlisted)

✓ TTA with NAMI for Integration into ASTB

## Training

Training: Automated entities & Scenarios

Realistic: Deliver computer generated forces & scenarios built from raw data

Mission Scale: Rapid generation of large numbers of synthetic entities and realistic mission relevant scenarios

✓ TTA with Next Generation Threat System (PMA-205) & UCLASS

Integrated Design, Select, and Train for Mission Effectiveness with UASs
Seamless Virtual/Constructive training
- C2 with tactical players
- Quantified human system performance with mission effectiveness metrics
- Safe, live virtual constructive training
- Individual adaptive team training
- Increased Complexity
- Increased players

Timely and effective training reflecting dynamic operational insights/challenges
- Personalized, adaptable, point of need training
- Integrated regional ally mission preparation
- Credible synthetic players: persistent, generative, robust
- Continuous, real time, high fidelity training with LVC multinational partnering – when and where needed

DoD Priority Steering Council – Training Technology End States

Mission Effectiveness (% Current)

Years Speed to Train for Full Mission Effectiveness Hours

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Objective: machine intelligence for autonomous systems
• peer-to-peer human-machine interaction,
• and high levels of autonomous behavior
• in highly dynamic and complex battlespaces.

Humanoid Shipboard Robotics
• Firefighting
• First responder
• Inspection & maintenance

Computational Cognitive Science
• Cognitive architectures
• Natural language dialogue
• Social Cognition

Future Impact
• Minimally supervised, easily taskable autonomous vehicles, robots & systems
• Cognitively-compatible control interfaces

SAFFIR Ship-board Autonomous Fire-Fighting Robot
Synthetic Environments for Assessment

Bottom Line: SEAs Implement Top-Down Value Estimation

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