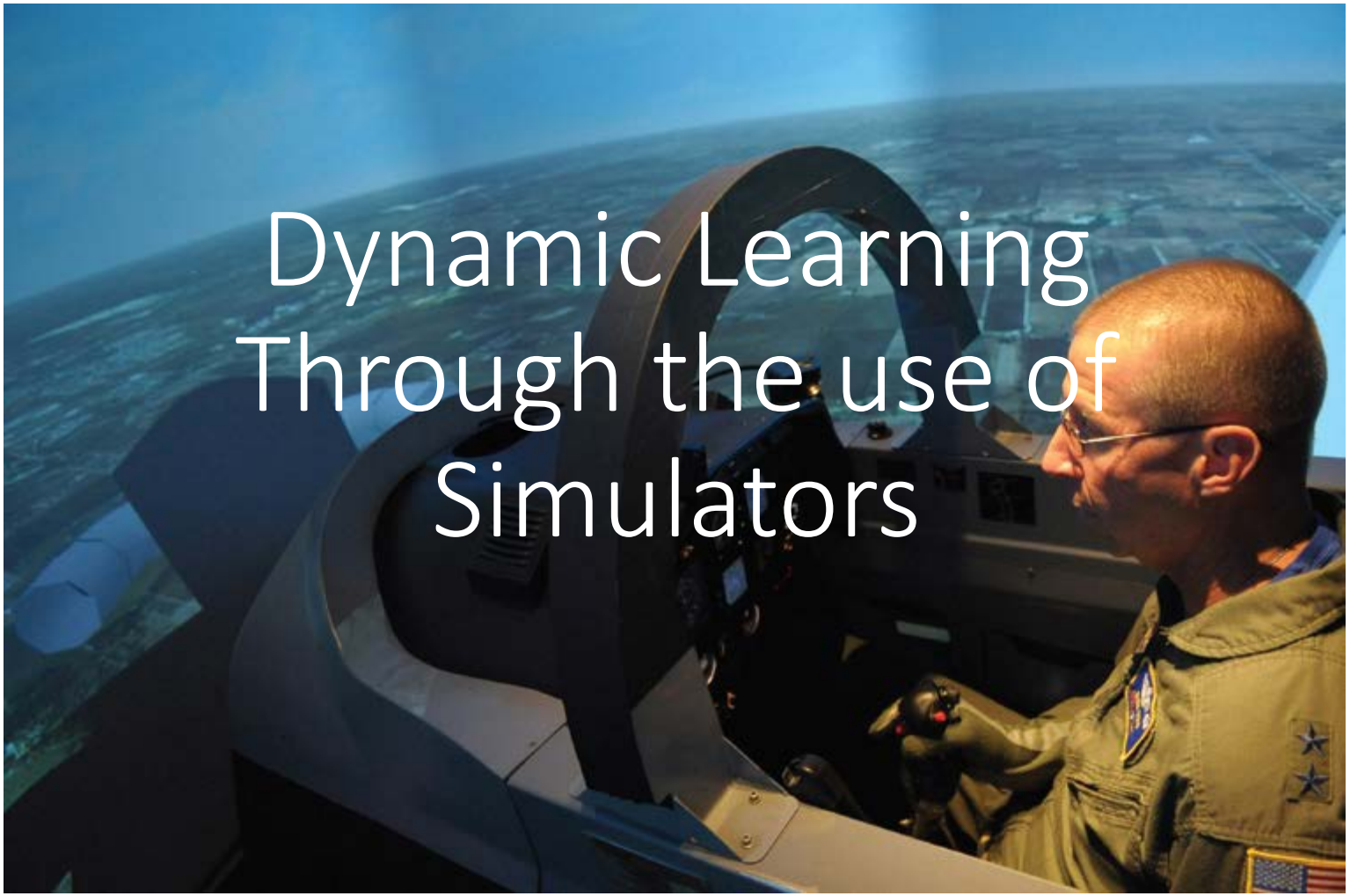
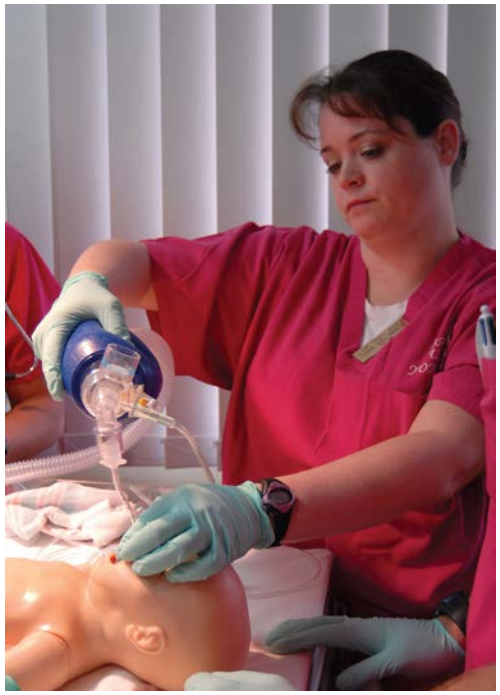


Dynamic Learning Through the use of Simulators

Modeling and Simulation (M&S)

- Designated as a “National Critical Technology” in 2007
  - ~ $7.5 Billion spent each year by the DoD
  - Changing the face of healthcare
  - Improving manufacturing design efficiency
  - Poised to have a profound impact on education & training
  - Serious Gaming
  - Virtual moving from just simulated environments to social interactions



A New Model of Learning

- Learning – Engagement that changes perception, belief or behavior

Learning is Social

Learning is Contextual

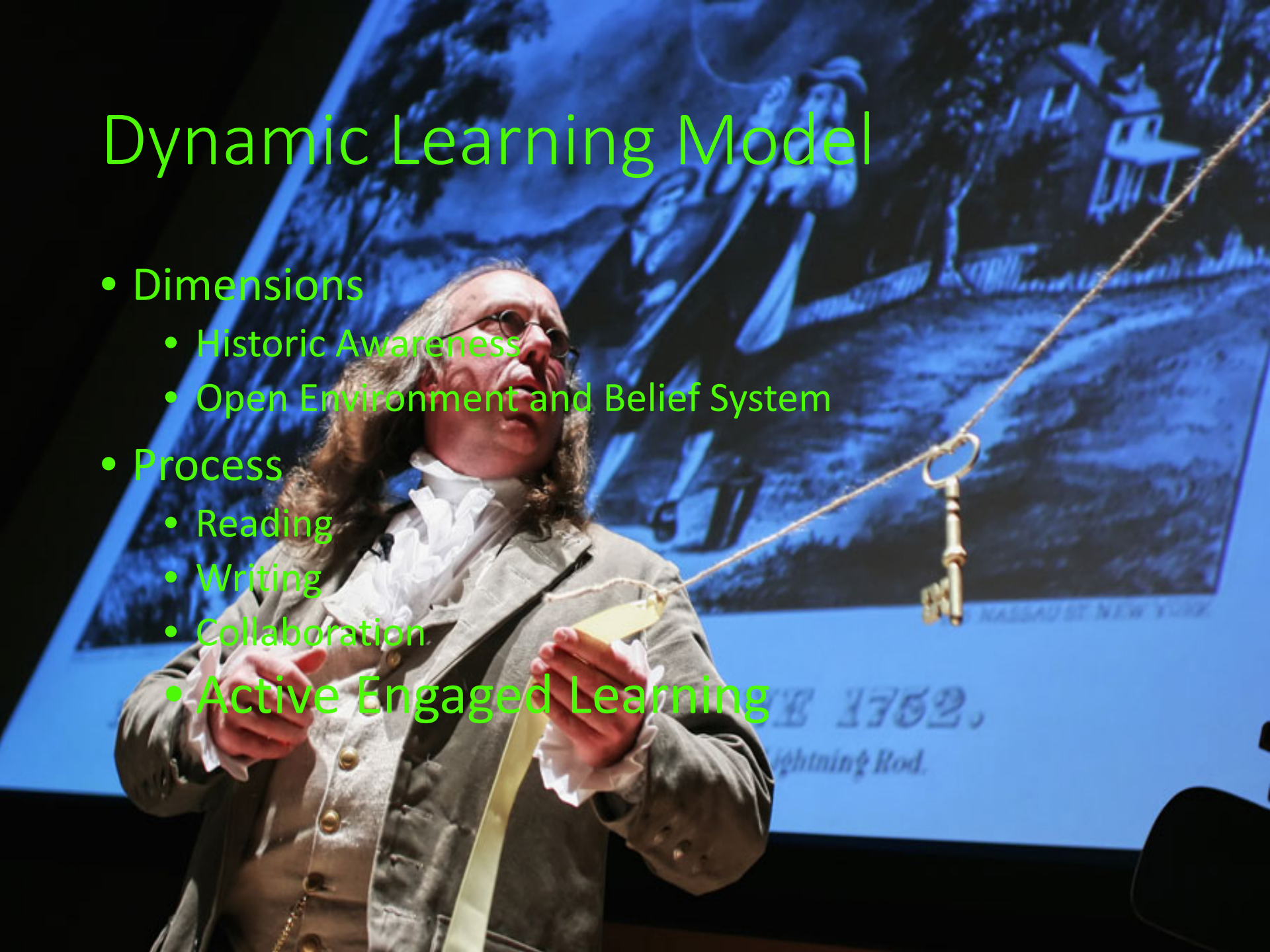
- Learning occurs only when students process new information or knowledge in such a way that it makes sense to them in their own frames of reference

Dynamic Learning

- *Learning is engaged and reflexive participation in a life-discovery process that builds new knowledge and enhances the development of skills and competence appropriate to the personal, social, and technical contexts of importance to the learner*

Dynamic Learning Model

- Dimensions
  - Historic Awareness
  - Open Environment and Belief System
- Process
  - Reading
  - Writing
  - Collaboration
  - Active Engaged Learning



POLICE
POLICE

MIXING STAGE #1

What is a Simulator?

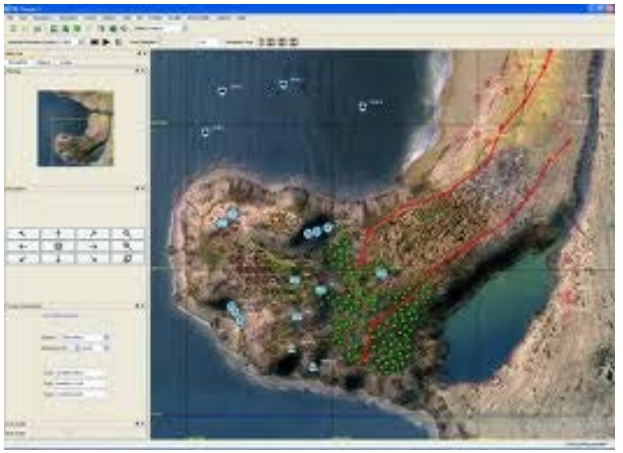
- Simulator
  - Hardware or apparatus that generates the simulation
- Simulation
  - The representation of conditions approximating actual or operational conditions
- Scenario
  - A specific simulation with a specific objective.

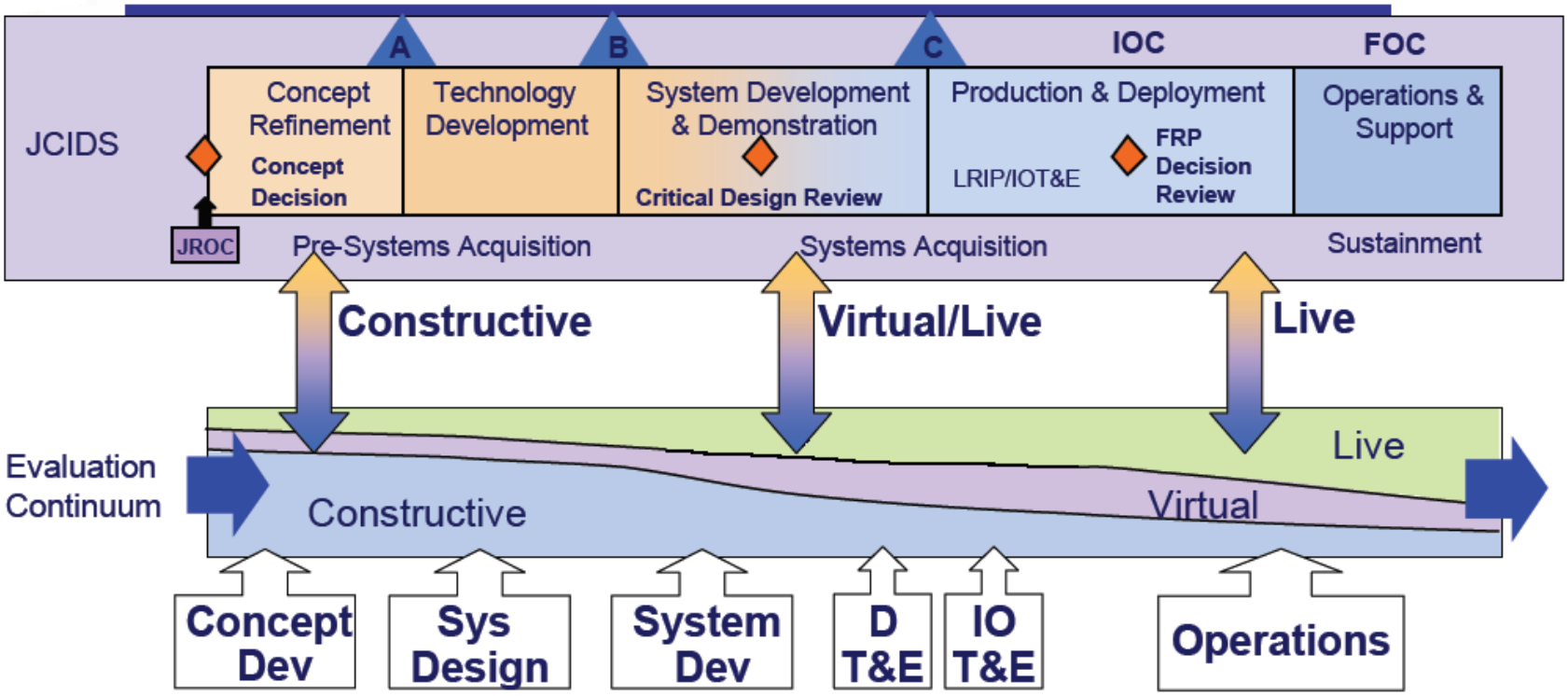
Why Use a Simulator?

- Skill Transfer
- Dynamic
- Engaging
- Contextual
- Relevance
- Experimentation
- Verification
- Validation
- Safety
- Evaluation
- Team Building and Team Dynamics

Types of Simulators

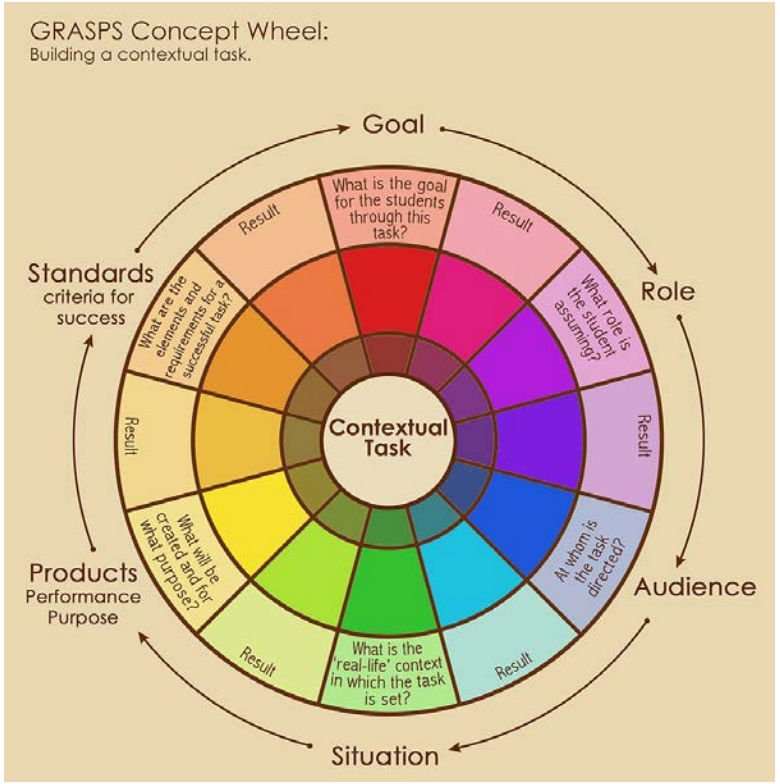
- Live = Humans and/or equipment and activity in a setting they would normally operate in for real
- Virtual = Humans and/or equipment in a computer-controlled setting
- Constructive = Typically does not involve humans or real equipment




A
B
C
IOC
FOC
JCIDS
Concept Refinement
Concept Decision
Technology Development
System Development & Demonstration
Critical Design Review
Production & Deployment
LRIP/IOT&E
FRP Decision Review
Operations & Support
JROC
Pre-Systems Acquisition
Systems Acquisition
Sustainment
Constructive
Virtual/Live
Live
Evaluation Continuum
Live
Virtual
Constructive
Concept Dev
Sys Design
System Dev
D T&E
IO T&E
Operations

So what's needed?

- Planning and Design Criteria
  - Students
  - Task
    - Complexity
    - Hazards
- Fidelity
- Functional Design Criteria
- Instructors
- Scenarios
- Integration



Fidelity……the degree to which a model or simulation reproduces the state or behavior of a real world object

Functional Design Criteria

- Inherently safe
  - Hazardous Energy Control
  - Ergonomics
- Design Team
  - Multiple disciplined
- Flexible

Instructors

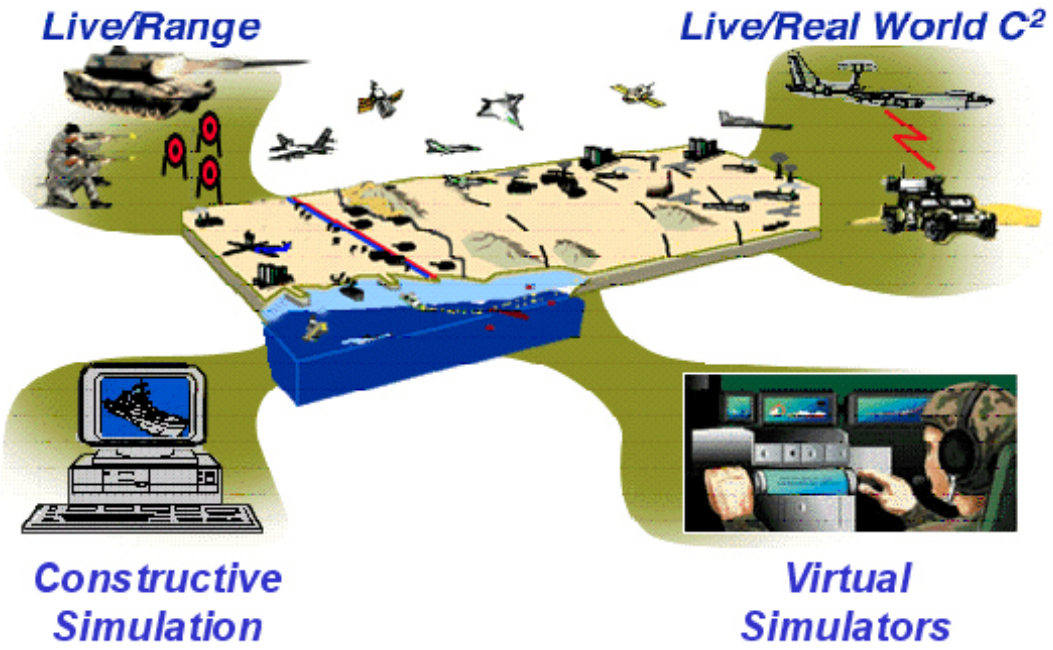
- Senior Instructors with a wide breadth of knowledge/experience
  - Operations/Maintenance Background (real-life experience with the systems, processes, or equipment being simulated)
- Deep understanding of the simulator capabilities
- Passionate
- Strong Communication and Facilitation Skills

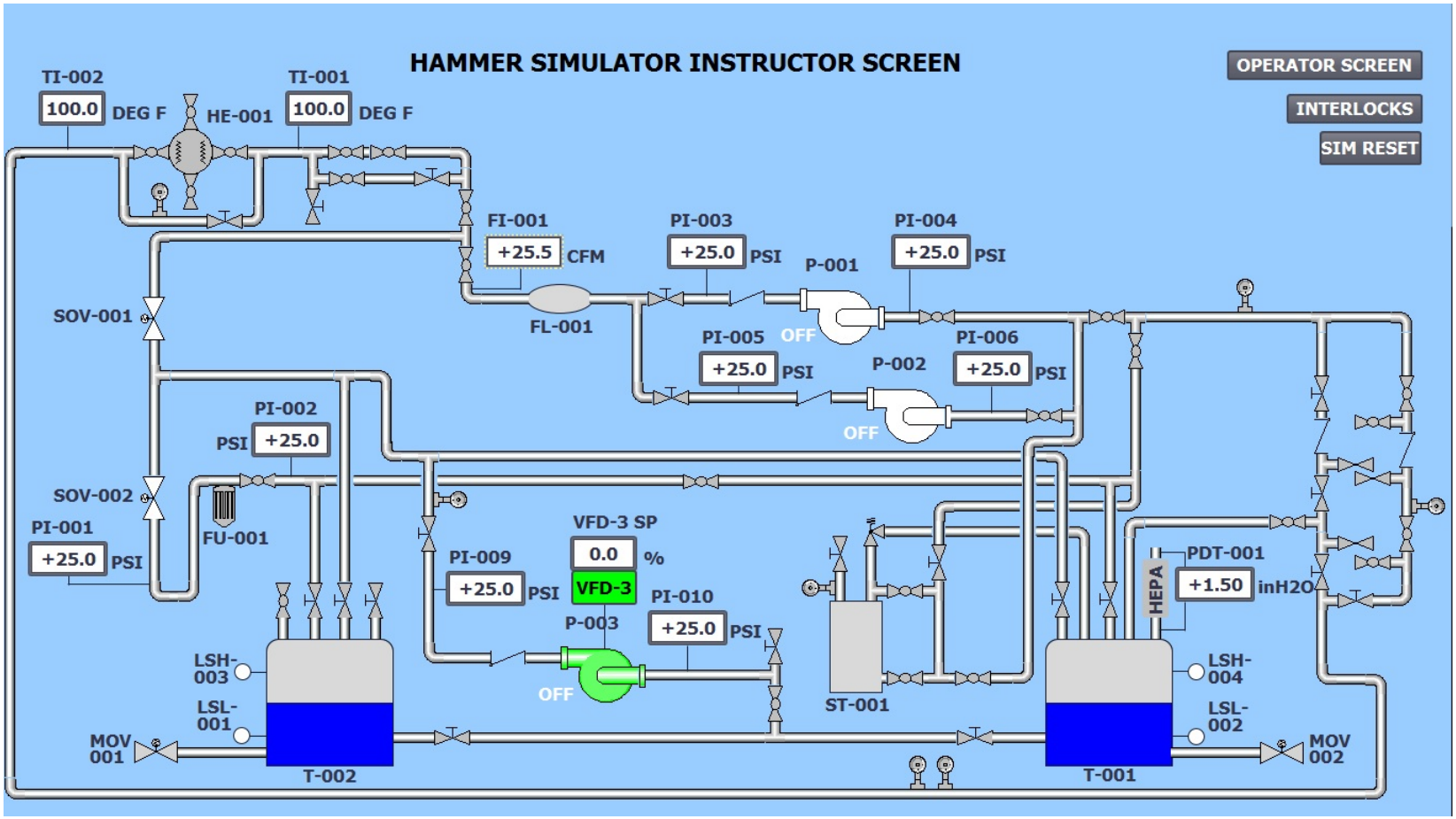
Scenarios

- Individual components, equipment, and systems
- Normal startup, operation, and shutdown
- Response to plant/system transient, abnormal, and emergencies
- Plant and industry operating experience
- Re-enforcement of theory and fundamentals
- Teamwork, communications, diagnostics

Integration

- Learning Modalities
- Functional Areas
- Simulations

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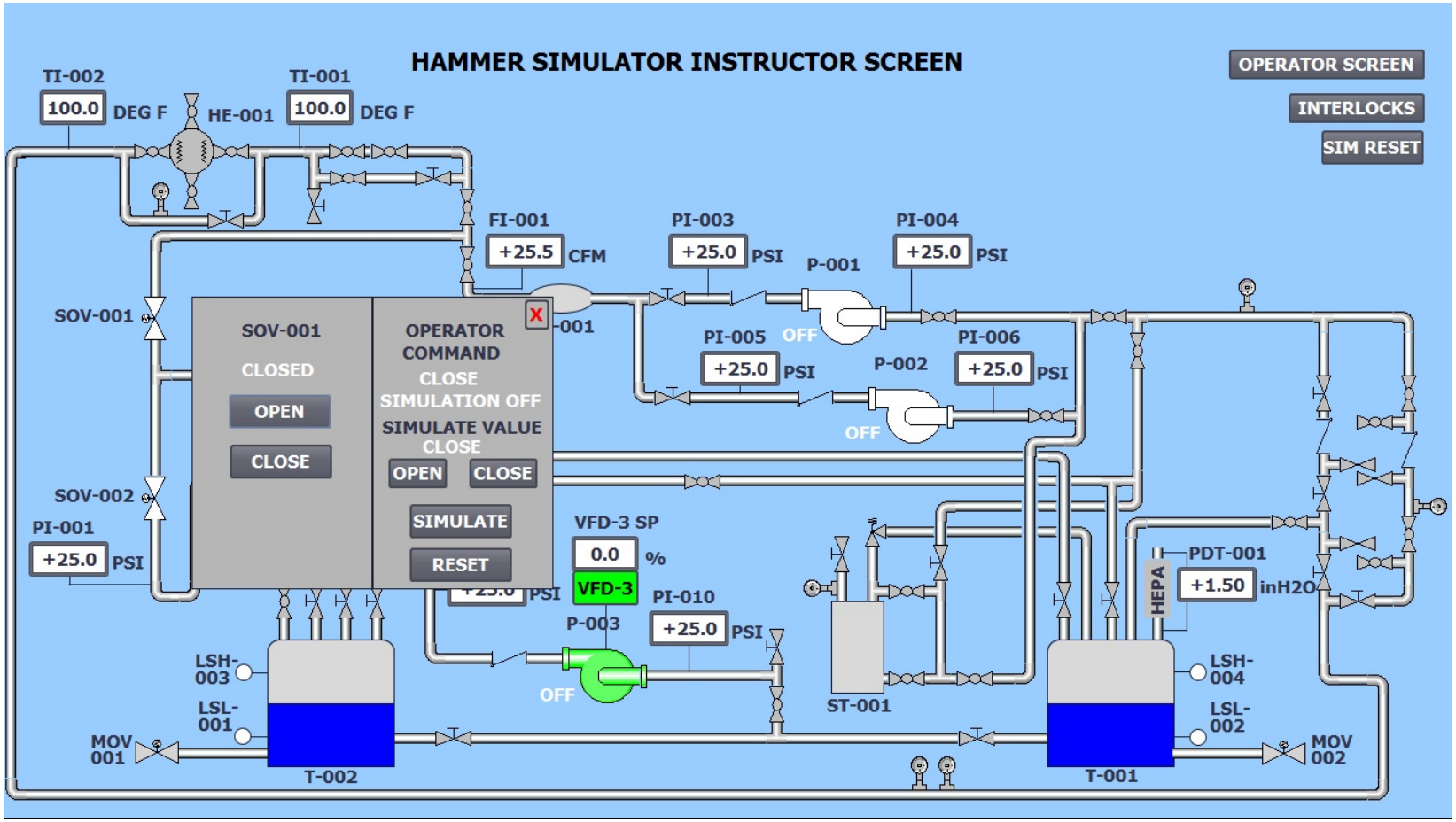
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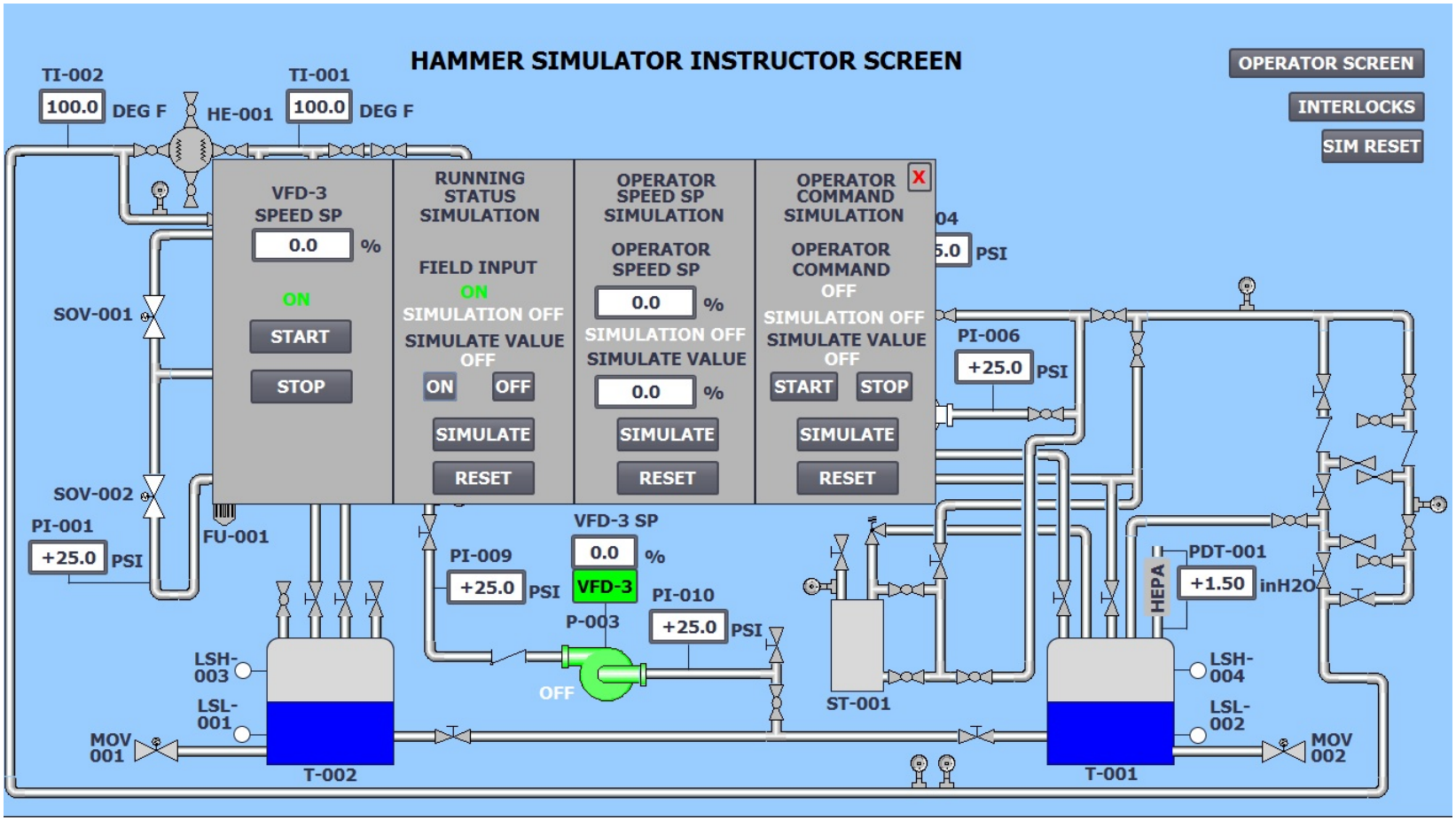
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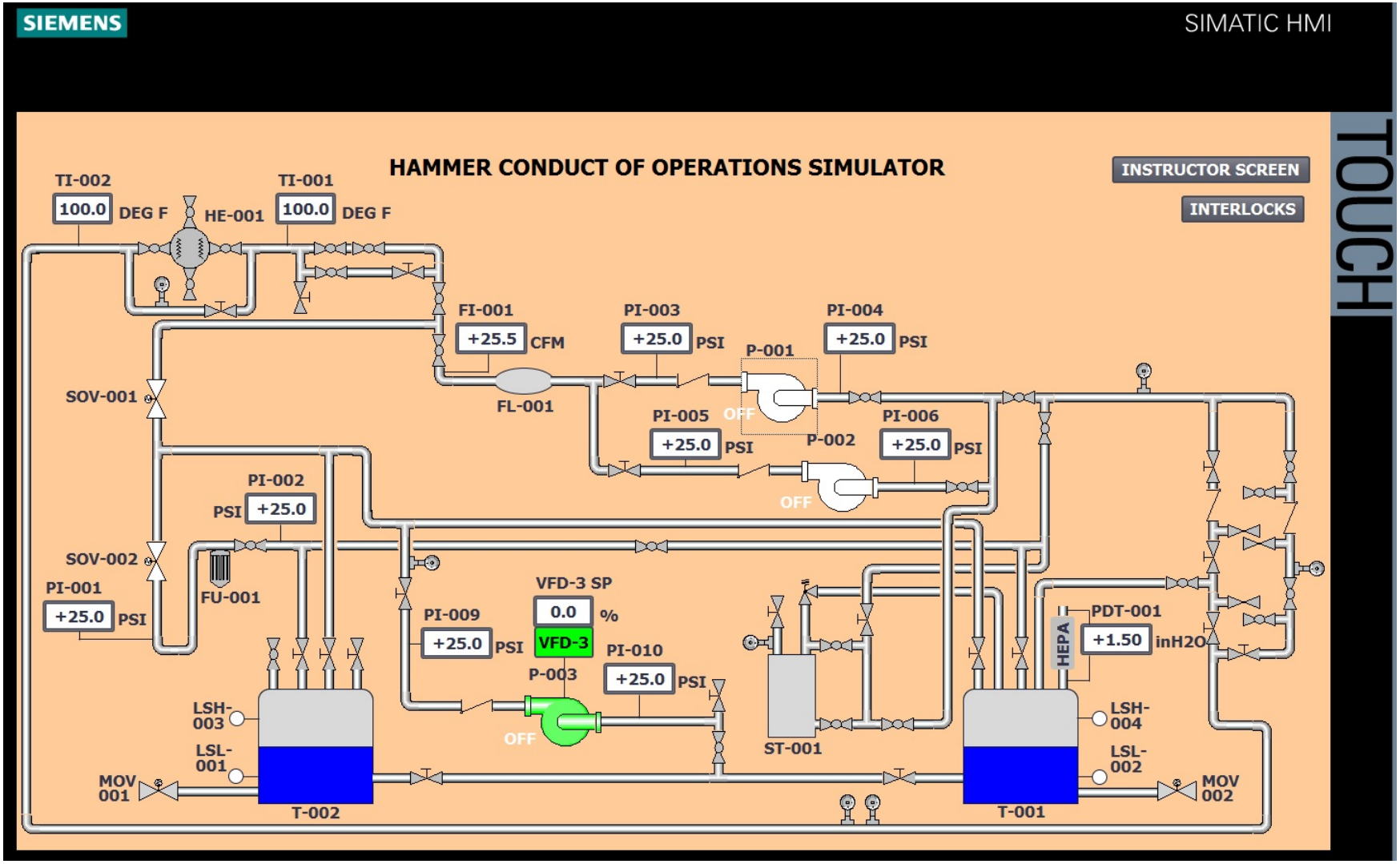
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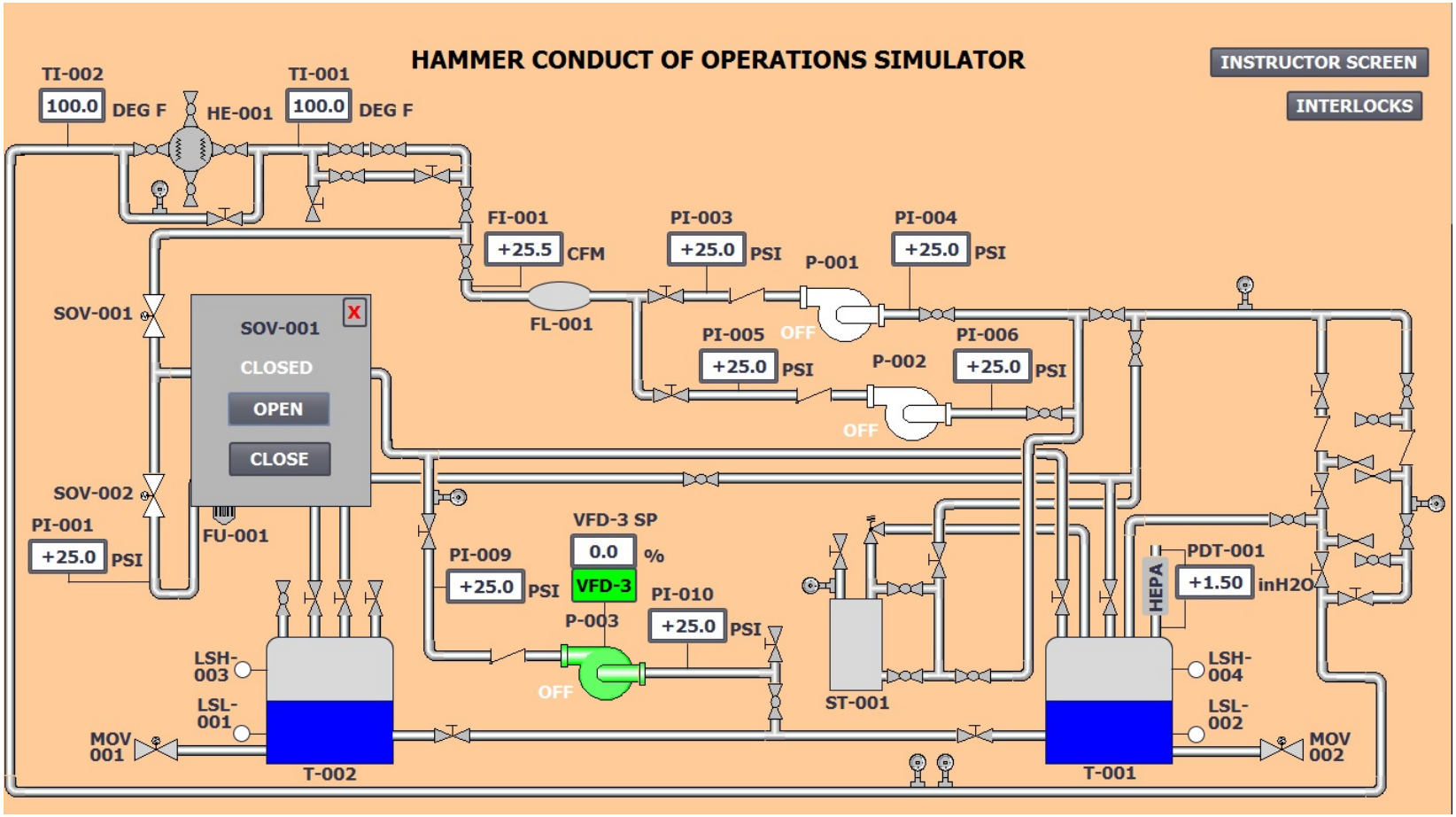
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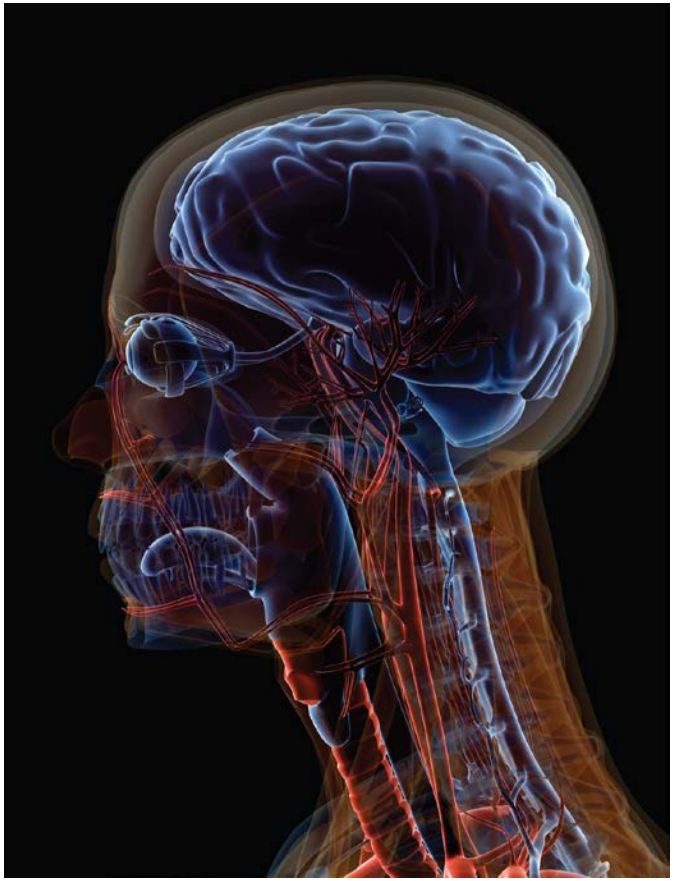
CFA
SIMULATOR

Typical Content for Simulator Evolution Procedure/Lesson Plan

- Purpose & Scope
- Type of training
  - Demonstration
  - Training
  - Evaluation
- Instructor guidelines
- Use of procedures



Typical Content for Simulator Procedure (cont.)

- Conducting and evaluating training
  - Instructor requirements
  - Briefings
  - Conduct of simulation
  - Post-exercise critiques
  - Individual or team evaluation
- Crew composition
- Required evolutions
- Use of evaluation guides
- Use of simulator features

Conclusions

- Simulators offer a unique opportunity for learning
  - Allow practice in a safe environment
  - Reduce costs
  - Provides a platform that is engaging, dynamic, contextual, and social
- Computer Hardware/Software will now support almost unlimited possibilities in human-in-the-loop virtual/life simulations

Virtuix Omni Video