



OFFICE OF RESEARCH & DEVELOPMENT

2012 **R&D**
REVIEW

THE CAB TECHNOLOGY INTEGRATION LABORATORY (CTIL)



U.S. Department
of Transportation
**Federal Railroad
Administration**

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Office of Research and Development
Office of Railroad Policy and Development

Program Area & Risk Matrix

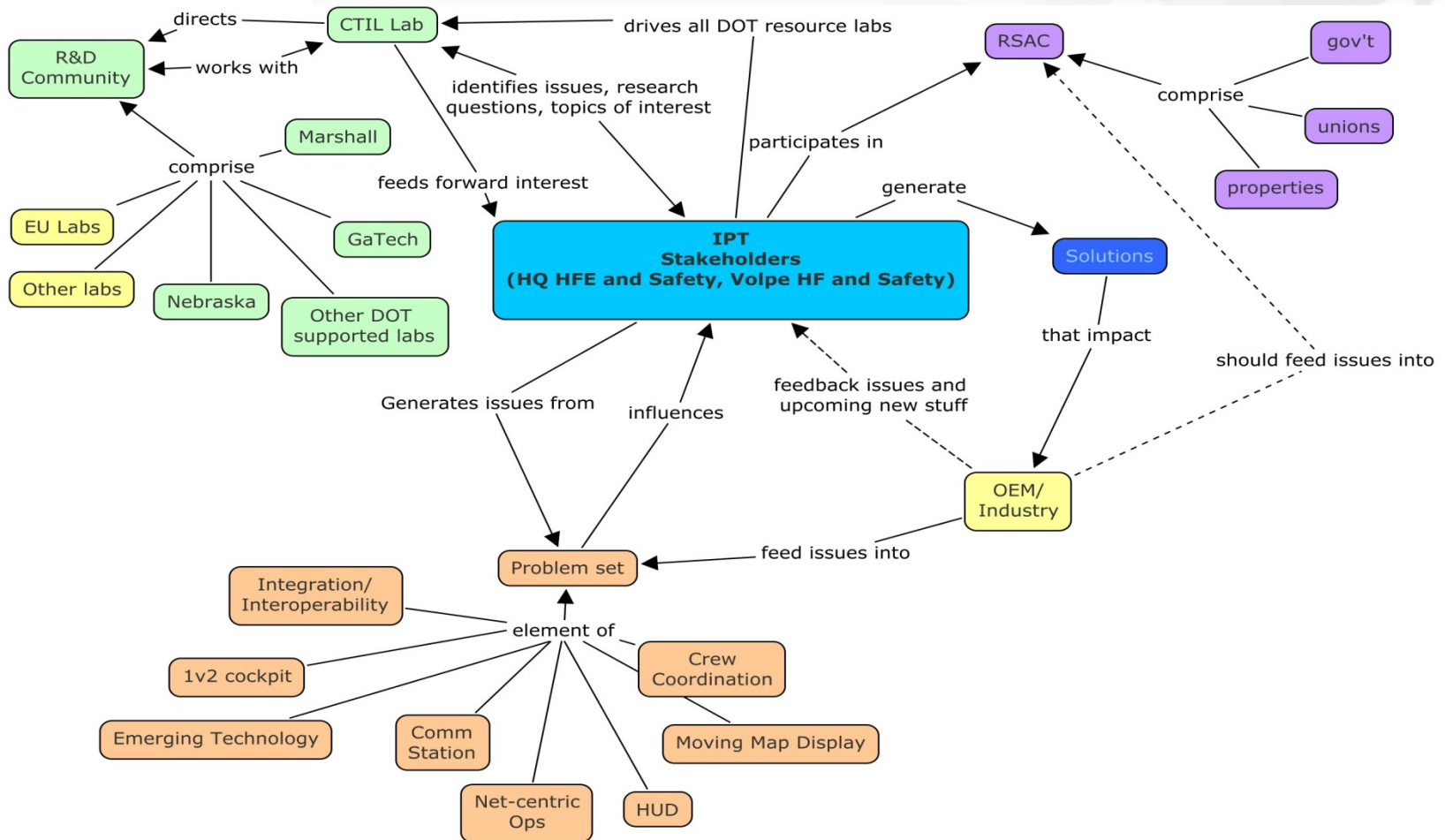
The Cab Technology Integration Laboratory (CTIL)

Program Areas	Risk Factors	Trespass	Grade Crossing	Derailment	Train Collision	All Other Safety Hazards
Railroad Systems Issues						
Human Factors					X	
Track & Structures						
Track & Train Interaction						
Facilities & Equipment						
Rolling Stock & Components						
Hazardous Materials						
Train Occupant Protection						
Train Control & Communications						
Grade Crossings & Trespass						

CTIL Program Description

- Tool to Enable research to demonstrate and assess the Human Machine Interface (HMI) of new technologies, prototype workstation configurations and examine operating procedures by evaluating human performance
- Tool to Enable research that can help reduce the risk of human errors by identifying potential HMI system and operational weaknesses and developing improvements in system design, training, and/or procedures to address those risks.

CTIL Concept & Stakeholders



Benefits

Research in CTIL yields:

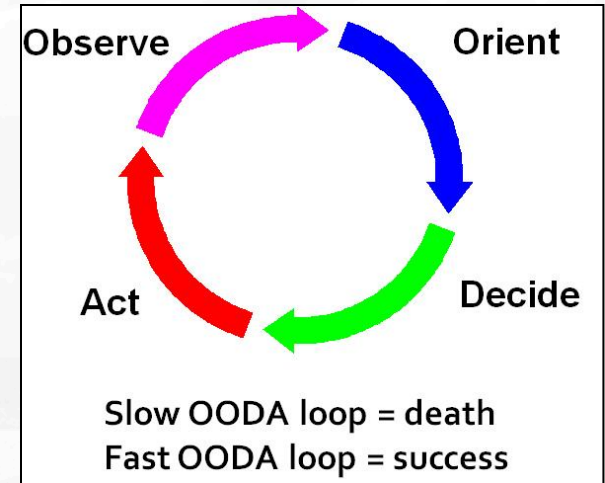
- Baselines for locomotive operator performance
- Methods to improve locomotive operator performance
- Identifying ergonomic issues related to cab design and layout
- Guidance for the integration of crew supportive technology for the benefit of safety and performance
- Assessing the impact of new locomotive cab technologies, displays, controls and configurations

Simulation in Test and Evaluation

The acquisition continuum – RDT&E

Human-System Integration

- Function allocation and the Observe, Orient, Decide, Act (OODA) Loop
 - Mission-oriented developmental test
 - Integrated systems testing
 - F/A-18 HOTAS
 - Variable fidelity: From 19” rack to ACETEF
 - A-6F, V-22, Shuttle upgrade...CTIL
 - Simulation: Application of technology to create an illusion



Information Exchange and Interoperability

- Embedded training: Distributed Interactive Simulation; DMSO

Research Applications to Systems Engineering (SE) and Human Systems Integration

- Moving from Research → Engineering and Development → Delivery → Use → Retirement → Research
- Systems Engineering is interdisciplinary and ensures that the customer's needs are satisfied throughout a system's entire life
- Model based SE is a toolset that allows early, efficient, low-risk iterative development support
- Capturing human requirements is essential for any system that you want to *actually* work



* Lifted from University of Arizona website: <http://www.sie.arizona.edu/sysengr/whatis/whatis.html>

Logistics of CTIL Data Analysis

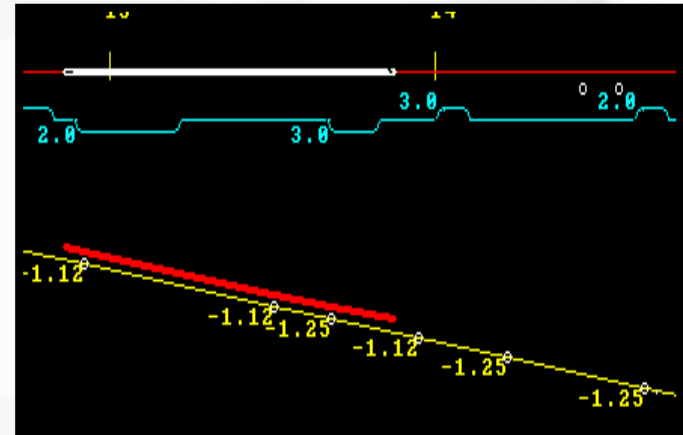
- The nature of streaming data implies a need to carefully plan and define analysis procedures before running subjects.
- Data reduction and familiarization require manipulating large datasets, and synchronization of data from multiple sources.
- Computerized experimental systems still require users to generate results.



CTIL Experimenter Control Stand, used for experimentation and data reduction/analysis.

Current and Upcoming CTIL Projects

- Moving map pilot study (Volpe)
- Design & evaluation of Sustained attention training (Veolia)
- Real-time scheduling decision support display and HUD for high speed rail (MIT – *upcoming*)



Panel Guests

- **Dr. Gina Melnik, Engineering Psychologist**
 - On CTIL research programs
- **Matt Isaacs, Operations Research Analyst**
 - On the intricacies of conducting research in CTIL
- **Dr. Jennifer Narkevicius, President Jenius Solutions**
 - On CTIL and the systems engineering process
- **Steve Harris, President Rational**
 - Example use of simulators for systems engineering in other domains