System of Systems and Live, Virtual, Constructive Test Capability

Global Capabilities

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Integration, Test, and Verification of Complex Systems: Verification and Validation Issues Panel

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Increasing Complexity Challenges to V&V

- Systems and systems of systems (S/SOS) are complex, and the complexity increases exponentially.
  How do we
    - Ensure that S/SOS are interoperable?
    - Know when an S/SOS meets the end user needs under all actual operational conditions?
- The inherent emergent behaviors (beneficial, neutral, and harmful) arising from systems of systems are difficult to understand, predict, and manage.
  How do we
    - Monitor, manage, and respond to emergent behavior and exploit emergent and unintended effects?
    - Detect and then correct critical anomalies?

Industry must revisit approach to V&V of complex systems/systems of systems
Hypothesis:
• Cross functionally ensure the concepts, requirements, architectures, designs, and operations are affordable, feasible, valid, producible, and testable across the life cycle
• Perform verification and validation as soon as possible to identify, mitigate, and retire program risks early

How will Boeing ensure:
• Our customers get the systems and products they want?
• Subsystem and system verification and validation is done right the first time?
Targeted LVC Test Identifies and Mitigates Program Risks Throughout the Life Cycle

Leveraging opportunities for injecting downstream issues of a prototype system into a controlled, complex SOS Test environment earlier in the life cycle.

Network Definitions:
- Soldier Radio Waveform (SRW)
- Wideband Networking Waveform (WNW)
- Directional Network Waveform (DNW)
- LabNet

Palmdale, CA:

Palmdale, CA & St. Louis, MO:
- Airborne simulations that completed the mission thread.

Huntington Beach Network Development Center:
- Constructive portion consisting of emulated/simulated radios.

Palmdale, CA, Huntington Beach, CA, Seattle, WA and St. Louis, MO:
- Test control and operation of the instrumentation system.

Note: Buildings will be ignored for Path Loss Calculations.

F15 Simulation
Primary Command Post will be at 6 with Alternates at 7 and 8.

LABNET

Emulated/Simulated Lab Environment
Huntington Beach CA

Live Operational Environment
Global LVC-Test Infrastructure

Common Live, Virtual, Constructive (LVC) Experimentation & Test Methodology

Elements
- Process
- Tool
- Training
- Skills
- Instrumentation
- Distributive test support utilities
- Persistent connectivity
- Reuse (repositories)
- Data archive
Industry must revisit the approach to V&V of complex systems/systems of systems.

Early and persistent, cross-functional engagement across a SOS life cycle is required.

Leveraging opportunities for injecting downstream issues of a prototype system into a controlled, complex SOS Test environment earlier in the life cycle helps identify and mitigate program risks throughout the life cycle.

Boeing has a global distributed, LVC test infrastructure for supporting V&V of complex systems.