0   5   10   20   40   80

WVR   BVR

Non-live deconfliction

Kill at range

Bug out, or drag

Missile Redirect – ensure live adversaries make it to merge

Blow-through – Non-live stay in altitude blocks.

LVC Sensor Augmentation data to modify real-world data

Adversary Aircraft: TSPI information, Threat Presentation

Real world, Raw Sensor Information available to sensors

0   5   10   20   40   80

WVR   BVR

RTB – No masking

Reveal: F-5 becomes visible to sensors

At range: F-5 cloaked to emulated T-50

WVR: F-5 unmasked for DACT safety

BVR: intermittent sensor cues, consistent with threat

2 — Live Adversary Masked upon Kill

Kill Remove below hard deck, cloaked once clear

3

5 — Proceed inbound as complex track

4 — Capture constructive track, re-spawn between 15-25 miles from merge

1 — Constructive Tracks from outside of training area

VIRTUAL AND CONSTRUCTIVE REPRESENTATIONS ON LIVE AVIONICS DISPLAYS (VCR-LAD)

Providing augmentation of live aircraft displays with entities generated by virtual and constructive simulations.

Training aircrews for modern CONOPS like Naval Integrated Fire Control-Counter Air (NIFC-CA) increases the scale and complexity of mission training requirements. This training capability gap is being addressed through Virtual & Constructive Representation on Live Avionics Displays (VCR-LAD). VCR-LAD provides augmentation of live aircraft displays with entities generated by virtual and constructive simulations.

Although some technical aspects of this type of integration have been examined in the past, the impact on aircrew (in terms of safety and training effectiveness) had not been studied in detail until now. The VCR-LAD project builds the needed Science and Technology (S&T) foundation for LVC integration into live aircraft avionics.

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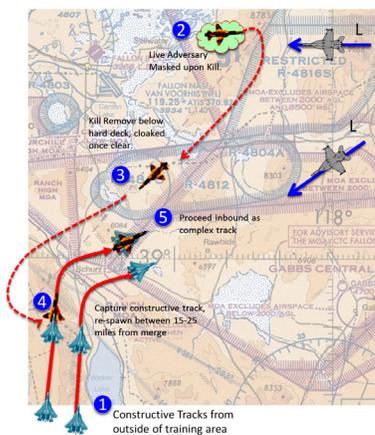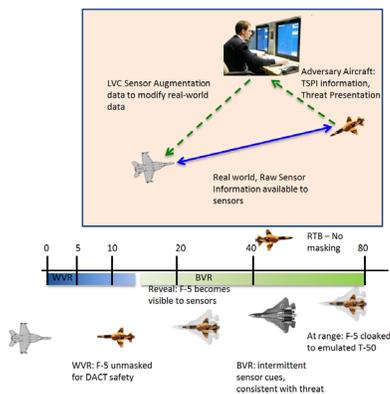
The research relates current training events to LVC augmented capabilities in order to investigate training impacts such as added workload, possible confusion about LVC entities, and data link induced safety-of-flight artifacts. The VCR-LAD program will produce safety recommendations for integrating LVC into platforms and training ranges, guidelines for the physical integration onto avionics and aircraft simulators, and data link/networking guidelines for LVC-enabled training systems.

LARGE-SCALE AIR WING-LEVEL TRAINING SCENARIO

During FY16, the team used the large-scale Air Wing-level training scenario as the backdrop for exploring the procedural and technical aspects of three advanced LVC capabilities involving complex tracks:

1. Clocking: focuses on masking actual sensor inputs

2. Virtual/Constructive Regeneration: allows live adversary aircraft to respawn

3. Mixed Sections: facilitates mixed Live and Non-live entities

Using NGTS to model the behaviors of the non-live entities, and collecting data using a live flying LVC-enabled jet training platform, VCR-LAD will perform scenario-based analysis on both live and non-live entities employing these advanced capabilities. The operational impacts to safety and training fidelity, as well as the technical aspects relating to networking as well as platform and training range integration will be incorporated into our knowledge products being produced.
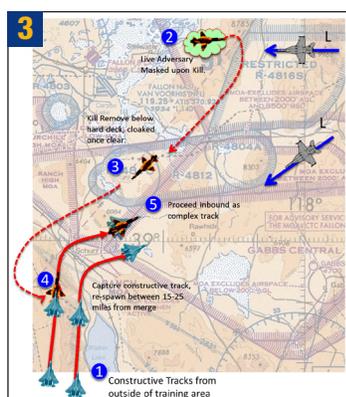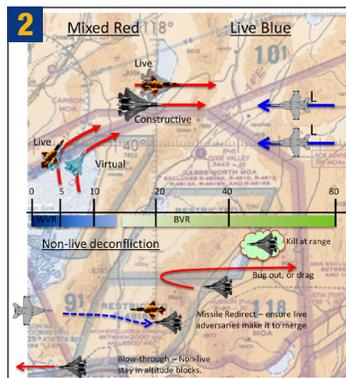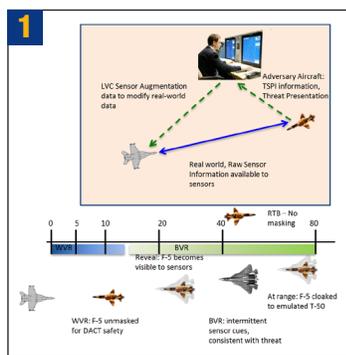
WHAT IT DOES

- VCR-LAD adds a critical element of LVC simulation to the training spectrum through a fully integrated representation of the LVC battlespace on live platforms
- VCR-LAD augments the information received from the aircraft avionics with synthetically generated information to present unified, consistent symbology
- VCR-LAD provides a set of guidelines and recommendations for safe, effective avionics and simulation integration, and a set of communications guidelines for maintaining consistency across the LVC environment

HOW IT WORKS

- Initial considerations are based on Safety-of-Flight and T&R criteria
- Through prototyping, experimentation, and hypothesis testing, the program creates traceable, substantiated design guidance
- VCR-LAD limits platform-specific modifications leveraging existing LVC standards and aircraft interfaces such as Next Generation Threat System (NGTS) and Navy Continuous Training Environment (NCTE)
- VCR-LAD knowledge products will drive training range and cockpit upgrades

WHAT IT WILL ACHIEVE

- Quantifies safety and efficacy of augmented cockpit displays for T&R
- Increases T&R spectrum of capabilities on existing ranges with limited air assets
- Reduces overall training life-cycle costs by accomplishing more activities per flight
- Allows for *Complex Tracks* that blend live aircraft and computer generated attributes to greatly improve the quality of the training produced with legacy adversary aircraft
- Enables *Virtual Range Extensions* that allow training to occur well beyond the physical constraints of the training ranges