Air Force Research Laboratory

Integrity ★ Service ★ Excellence

USAF
Weapons Technology

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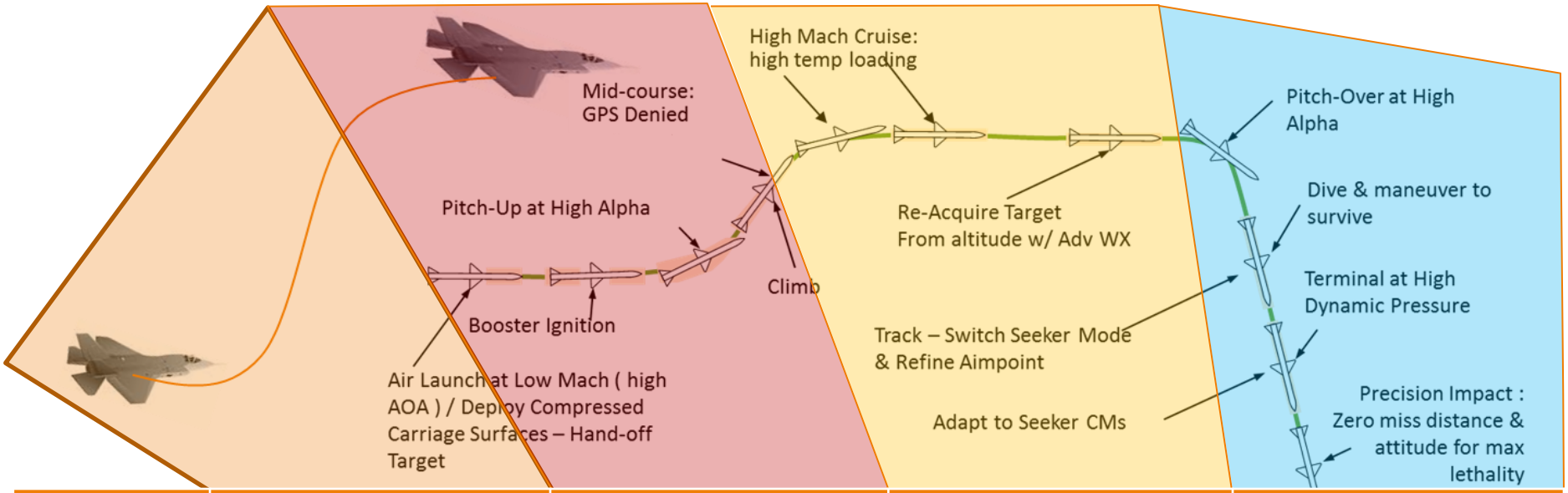
AFRL

Operationally Focused Outcomes
(Time Phased Organization of Goals)



Mission Phase	Mission Plan / Load A/C	Take off, Fly to Wpn Release Pt	Weapon(s) Flight to Terminal Basket	Enhance Weapon Effect
	Increase Sortie Effectiveness	**Improve (minimize impact) A/C Survivability**	**Optimize Weapon Survivability Enroute to Target**	**Maximize Effect on Target (Enhance Weapon Lethality)**

- We must understand the Capability Gaps in the context of each Phase
- Derive the S&T Objectives and Technical Challenges to mitigate the Gaps
- Many Tech Challenges require support from other S&T providers (e.g. *Weapons Enterprise*)
- Phases are <u>not</u> mutually exclusive ∴ a Systems Engineering approach/mind set is essential

Capability Area IPTs *linked* to CTCs

- Shaping our System Level Concepts -

CFMP Aligned GPA, SOF

Intra Theater Strike / Close Controlled Strike & Special Ops

CFMP Aligned AS

Air Superiority

CORE TECHNICAL COMPETENCIES

Ordnance Sciences

Fuze Technologies

Terminal Seekers

Munitions Systems Effects

Munitions Aero, GN&C

High Interest Technology

Long Range Strike

Challenging Target Set

Hard and Deeply Buried Targets

- Warfighter Engagement -

Collecting and Analyzing Operational Gaps & Challenges – Translating to … Tech Challenges

Demonstrations / Big Bets

- High Velocity Penetrating Weapon
- GBU-X / Flexible Weapon
- High Speed Strike Weapon
- Small Advanced Capabilities Missile
- Integrated Weapons Effectiveness Assessment
- CHAMP
- High Energy Lasers

High Velocity Penetrating Weapon (HVPW)

- **Flagship program concluding FY14**
- **High speed (boosted) penetration into hardened and deeply buried targets**
- **Maturation of Ordnance, Aerodynamics, GNC, and Propulsion technologies for Hard Target Munition AoA and future acquisitions**

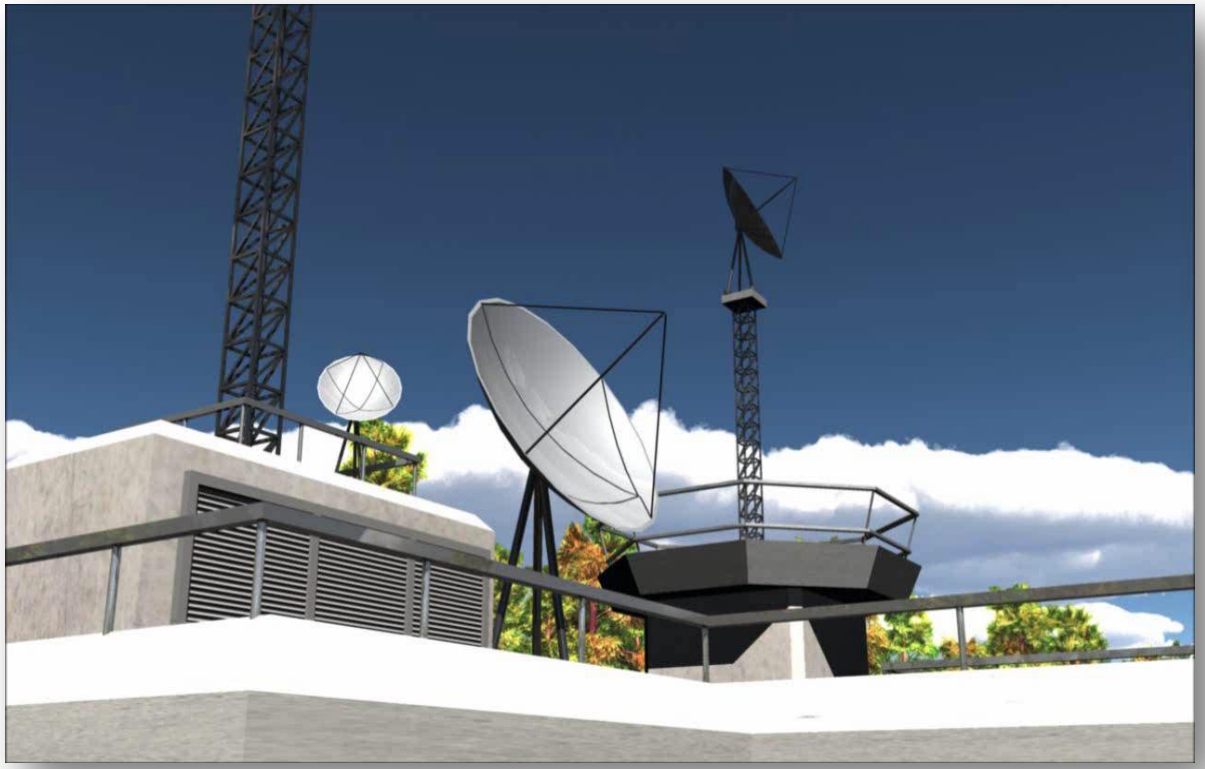
HVPW Technical Interchange Meeting
Eglin AFB, November 18-19, 2014

GBU-*X*

Agile, Flexible Effects, Lethality-Dense Weapons

- **Replace 50+yrs old MK series; modular weapons family - affordability in numbers**
- **Smaller size, same lethality for internal carriage**
- **Cooperative engagement, highly survivable in A2AD GPS-denied environment**
- **Propulsion, speed, range, effects complexity, performance, survivability & maneuver modules interchangeable on common vehicle architecture**

High Speed Strike Weapon (HSSW)

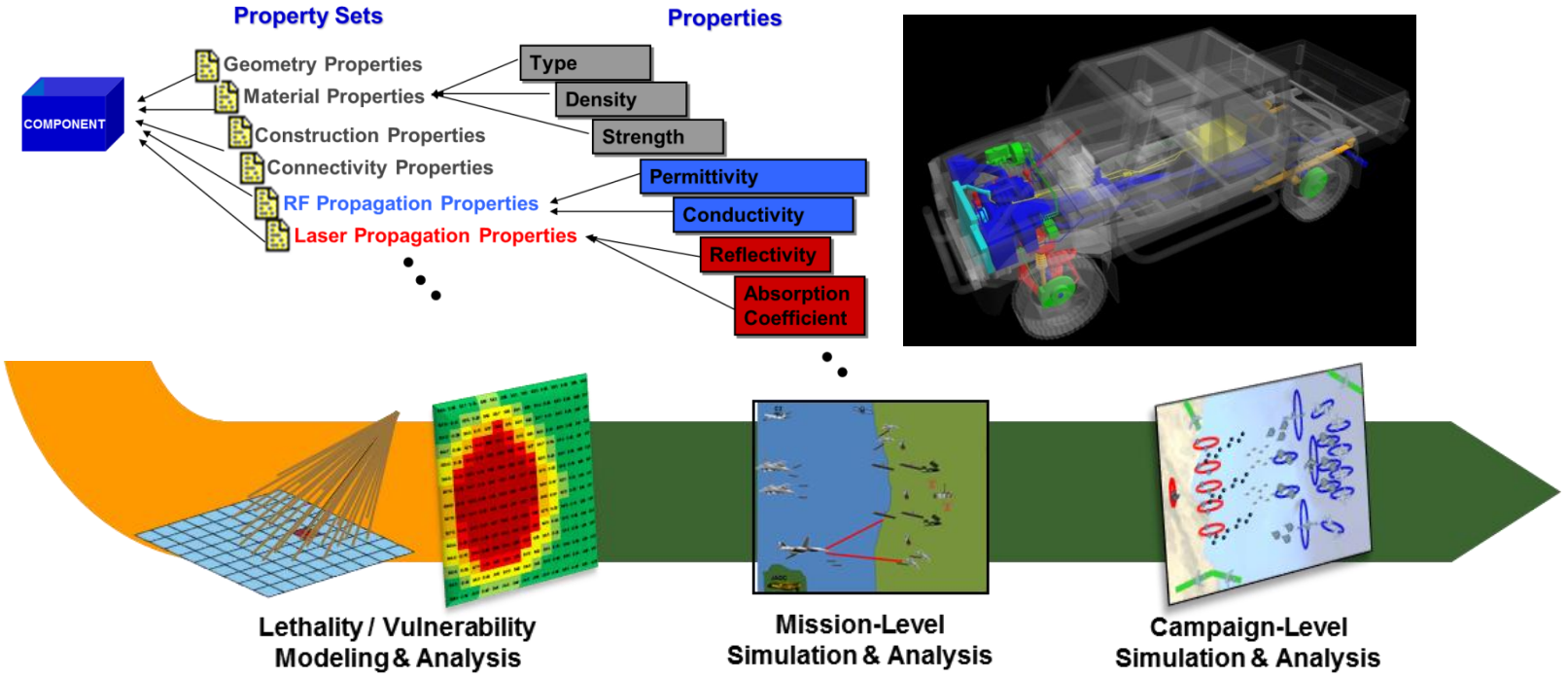


- Efficient ramjet and scramjet propulsion and rocket accelerator for long range flight
- In-flight retargeting for higher priority target / fighter-bomber compatible
- Lightweight high-speed, high temp structures
- Maturing key technologies - Guidance, Propulsion, Payload for future LRS system

Small Advanced Capabilities Missile (SACM)

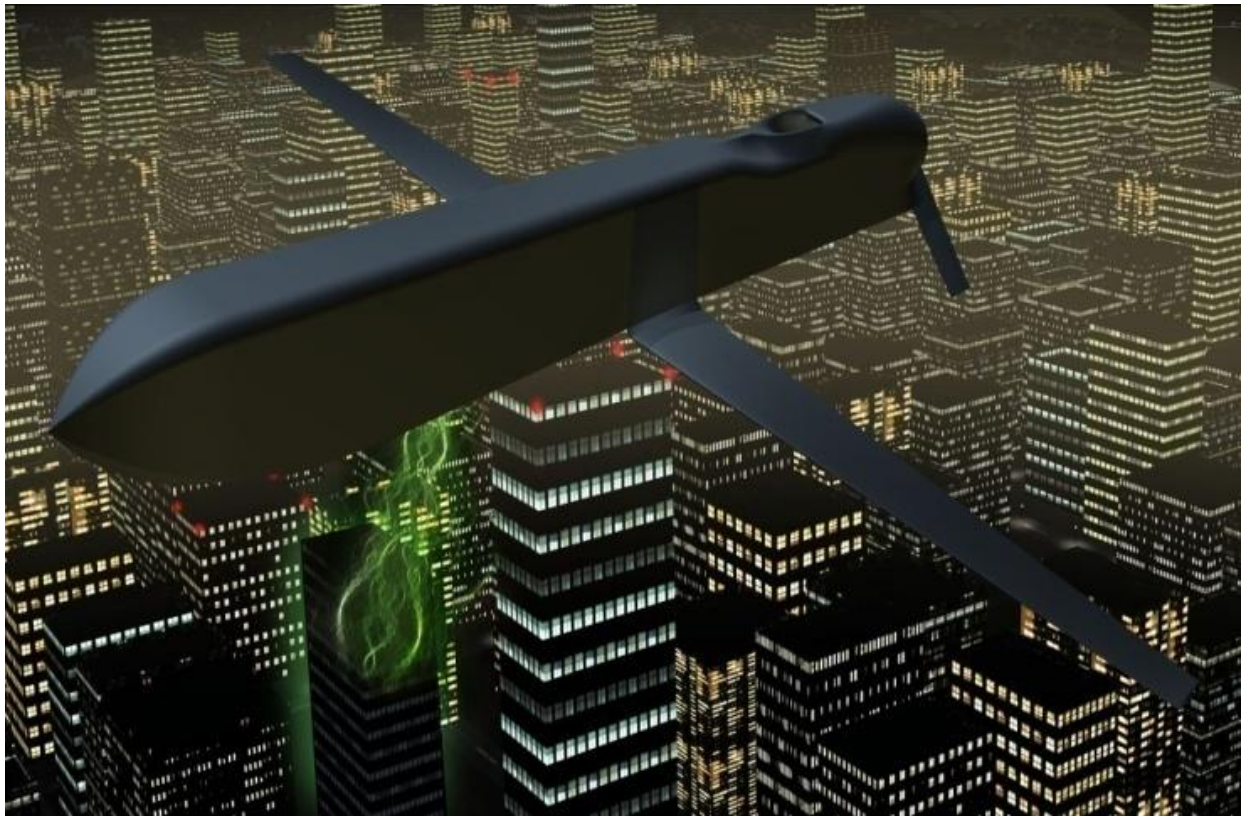
- **Flexible hyper-agile airframes, high impulse propulsion, affordable wide field of view seeker, anti-jam guidance integrated fuze, aim-able kinetic and non-kinetic effects**
- **Increased A/C loadout ---> increased sortie effectiveness**
- **Increased P_{we} with kinematic advantage & increased lethality**

Integrated Weapon Effectiveness Assessment (IWEA)



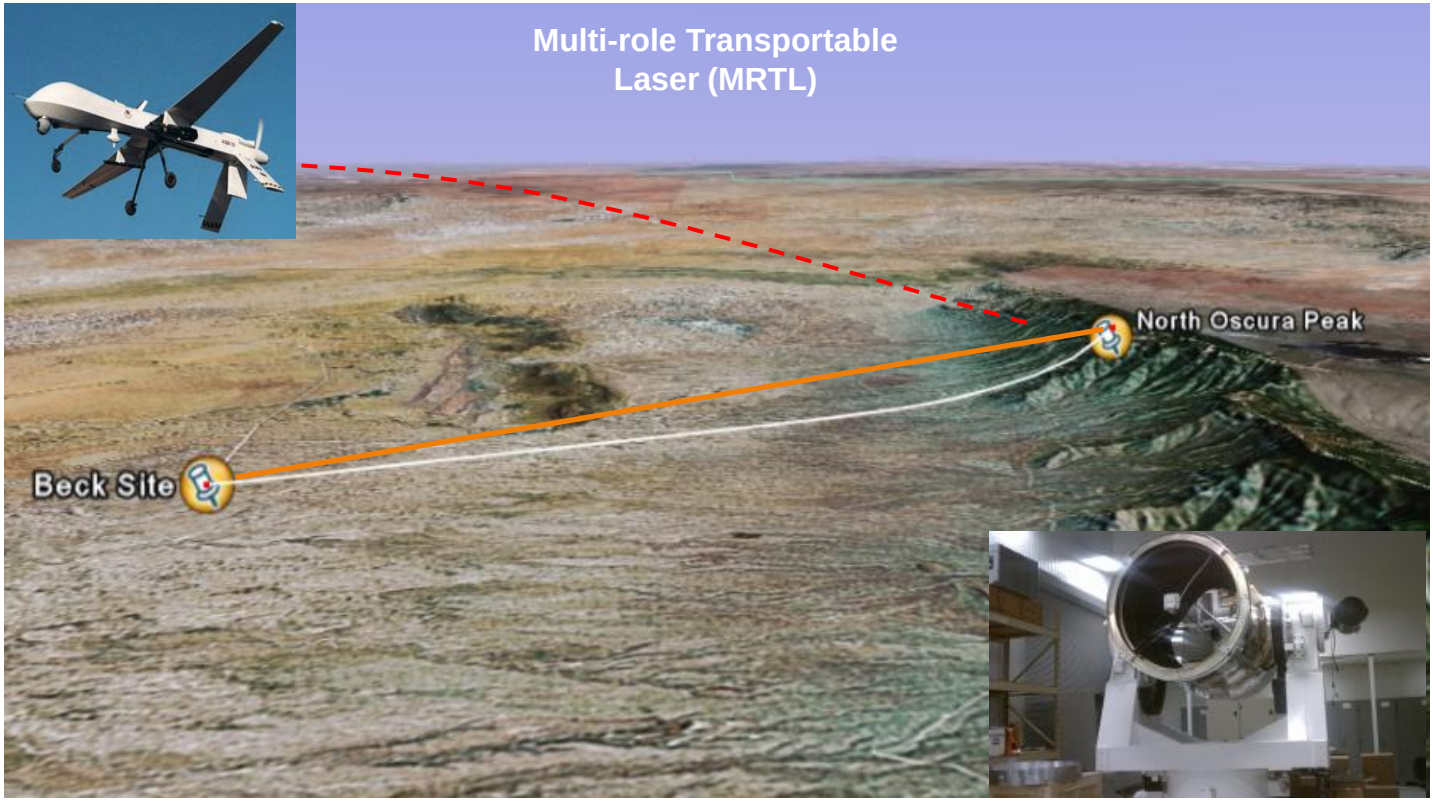
- Integrated kinetic energy / directed energy (KE/DE) weapon analysis environment
- Ability to analyze synergistic effects – common target models
- Methodology to optimize weapons mix – optimization algorithms to yield TTPs and combinations/sequence for KE-DE mission
- Confidence characterization – VV&A of numerous models
- Future – extend to cyberspace, space, and future non-kinetic effects

High Powered Microwave Advanced Missile Project (CHAMP)



- **Enable non-kinetic counter-electronic attack from an aerial platform**
- **Overcome current COCOMs constraints; kinetic weapons limited to one target, limited kinetic magazine, collateral damage, high post-conflict reconstruction costs**
- **Enables threat engagement scenarios that include kinetic-restricted targets**

Laser Weapon Systems



- **Regain Air Superiority in an A2/AD environment**
- **Improve SA and CID; provide high quality track information to air-to-air missiles; defeat air-to-air, ground-to-air missiles, and A/C**
- **Mid term - develop a ground based defensive capability**
- **Far term - efficient, light-weight HEL for Next Gen Tactical A/C**

AFRL Effects Based Vision

Fully *integrated weapons S&T portfolio* that exploits both the unique and complementary capabilities of *Kinetic and Directed Energy* systems in meeting the *needs of the US Air Force and the Joint Warfighter*

Summary

- **AFRL is poised to provide affordable technologies for future weapon systems**
  - **Kinetic Energy**
  - **Directed Energy**

- **AFRL relies heavily on partnerships with industry, academia and other national labs**

Air Force Armament Industry Days
Eglin AFB, April 15-16, 2014
www.industryday2014.com