AFRL

THE AIR FORCE RESEARCH LABORATORY

LEAD | DISCOVER | DEVELOP | DELIVER

Precision Strike Annual Review 2011

Weapons Science & Technology Investment Areas

23 February 2011

Colonel Ken Echternacht

Director, Munitions Directorate

Air Force Research Laboratory

A Stroll Through Weapon Technology

Outline

- US Air Force Mission
- AFRL Mission & Focus
- Munitions Directorate
- Core Technical Competencies
- Capability Planning
- Collaborations
- Summary

USAF Mission

The mission of the United States Air Force is to fly, fight, and win…

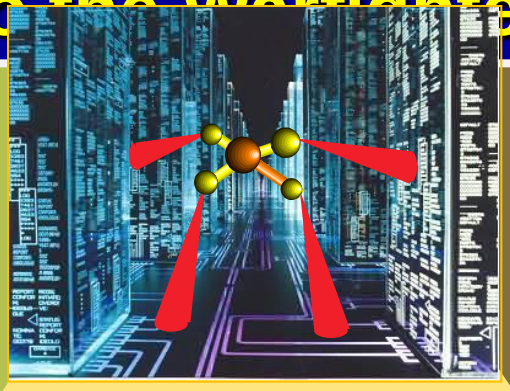
in

Air, Space, and Cyberspace

USAF S&T Vision

The mission of the United States Air Force is to fly, fight and win… in Air, Space and Cyberspace

Unparalleled Support to the Warfighter



Guides USAF S&T goals

Cyber

Links S&T to Warfighter

Air Force Research Laboratory Mission

Leading the **discovery**, development, and integration of **affordable** warfighting technologies for our air, space and cyberspace force.

AFRL Organization

Commander (CC)
Maj Gen Ellen Pawlikowski

Executive Director (CA)
Mr. Joe Sciabica

Vice Commander (CV)
Col Daniel Morin

Chief Technology Officer (CZ)
Dr. Morley Stone


AFOSR


Propulsion
(RZ)


Directed Energy
(RD)


Information
(RI)


711th Human
Performance Wing


Munitions
(RW)


Sensors
(RY)


Space Vehicles
(RV)


Materials &
Manufacturing (RX)

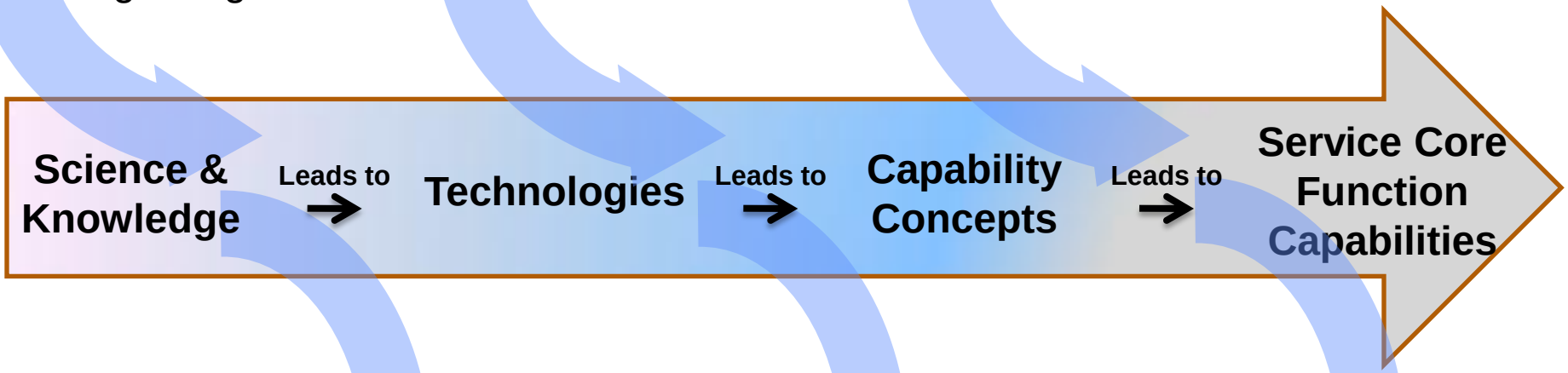

Air Vehicles
(RB)


Human
Effectiveness
(RH)

AF S&T
Turning Science into Capabilities

- Air Force Strategy
- OPsCs, CRRA, CFMPs
- Air Force S&T Strategy
- Technology Horizons
- Wargaming

\+ Center Needs + MAJCOM Needs



Outputs:
- New Technologies
- "The realm of the possible…"
- Tech Transfer/Some Tech Transition

Outputs:
- Mature Technologies
- New Capability Concepts
- Tech Transfer/Tech Transition

Outputs:
- Mature Capability Concepts
- Tech Transfer
- Tech Transition

Timeline:
IOC >25 years | IOC > 10 years | IOC >5 years | IOC >1 year

Capability Concepts

- **Warfighter Capability Based on Projected Performance Of Technology**
  - Built Up from Projects In Multiple Directorates but Often Driven by One Technology Area
  - Some in Response to Specific MAJCOM Need
  - Some Generated from Science Identifying the “Realm of the Possible”
- **Three Types Of Capability Concepts**
  - Flagship Capability Concepts (Goal 6-8) – AF-Level Designation, Our Top Priority for Transition
  - Capability Concepts (Goal 50-60) – Clearly Defined Warfighting Capability with MAJCOM Interest But Transition not Secured
  - Planning Capability Concepts (Goal~80) – Good Ideas and Concepts but not Mature or Well Enough Defined Yet
- **Flagship Capability Concepts**
  - Championed by a User, Preferably with Transition Money Identified
  - Designated by the CSAF/SECAF, Vetted Through the AF Corporate Process
  - Rigorous Systems Engineering Applied
  - Funded & Baseline Controlled at the HQ AFRL Level

DEFENSE THREAT REDUCTION AGENCY

AFRL MUNITIONS

AIR ARMAMENT CENTER

AFOTEC Det 2

53rd WING

20th SPCS

JOINT FIRES INTEGRATION AND INTEROPERABILITY TEAM

NAVY EOD SCHOOL

COAST GUARD

ARMY RANGERS

ARMY 7th SFG

AFSOC (919th and 1st SOW)

33rd WING

10

AFRL Munitions Directorate

Vision:

Precision Engagement….

Delivering Desired Effects

Mission:

Lead the discovery, development, integration, and transition of affordable precision engagement technologies for our air, space, and cyberspace force

AFRL / RW – *Value to the Warfighter*

- **We stay *constantly engaged* and responsive to evolving challenges and opportunities**
- **We support both the *current fight and the future Air Force***
- **We take a very disciplined approach to *prioritizing our portfolio***
- **We deliver the most *cost effective S&T* regardless of source**
- **We have a sustained track record of successful *transitions***

Relevant & Innovative ... Rapid & Responsive

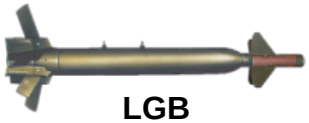
Transition *Vision, Knowledge & Products*

Ongoing and Upcoming Challenges

- **Enabling our Next Generation Delivery and Strike Platforms …**
  - Next Generation Missile
  - Next Generation Penetrator
  - Long Range Strike
  - Small and Selectable Effects Weapons
  - Directed Energy
- **Sustaining our Legacy Weapons and Platforms …**
- **Leading the Way in the Discovery of Game Changing Science and Technologies**

Capability Transition / Delivery

Legacy



LGB

BLU-121

AMRAAM

Shredder ATD

GBU-28 “Bunker Buster”

Crash-Pad

JDAM

PAW

JASSM

MOAB

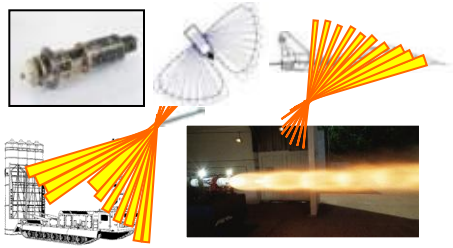
HTSF

FLM

SDB I

BATCAM

Future



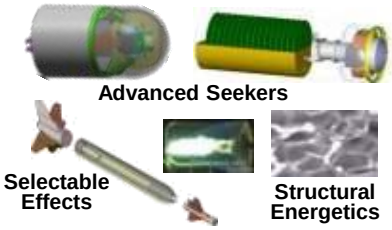
A-A Superiority
SEAD / DEAD &
Electronic Attack

Long Range / Intra-Theater Strike

Long Range Strike

Close Controlled
Strike & Special Ops

Micro-Weapons for
Novel target Effects



Intra-Theater / Close
Controlled Strike

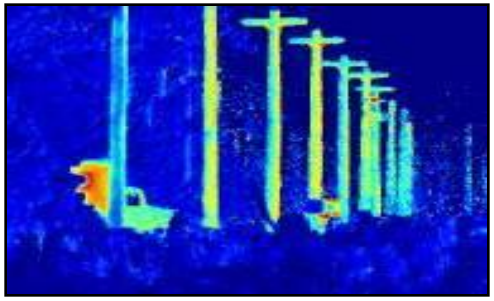
Core Technical Competencies
Investment Areas

Damage Mechanisms

Fuze Technologies

Energetic Materials

Munitions Integration & Demo

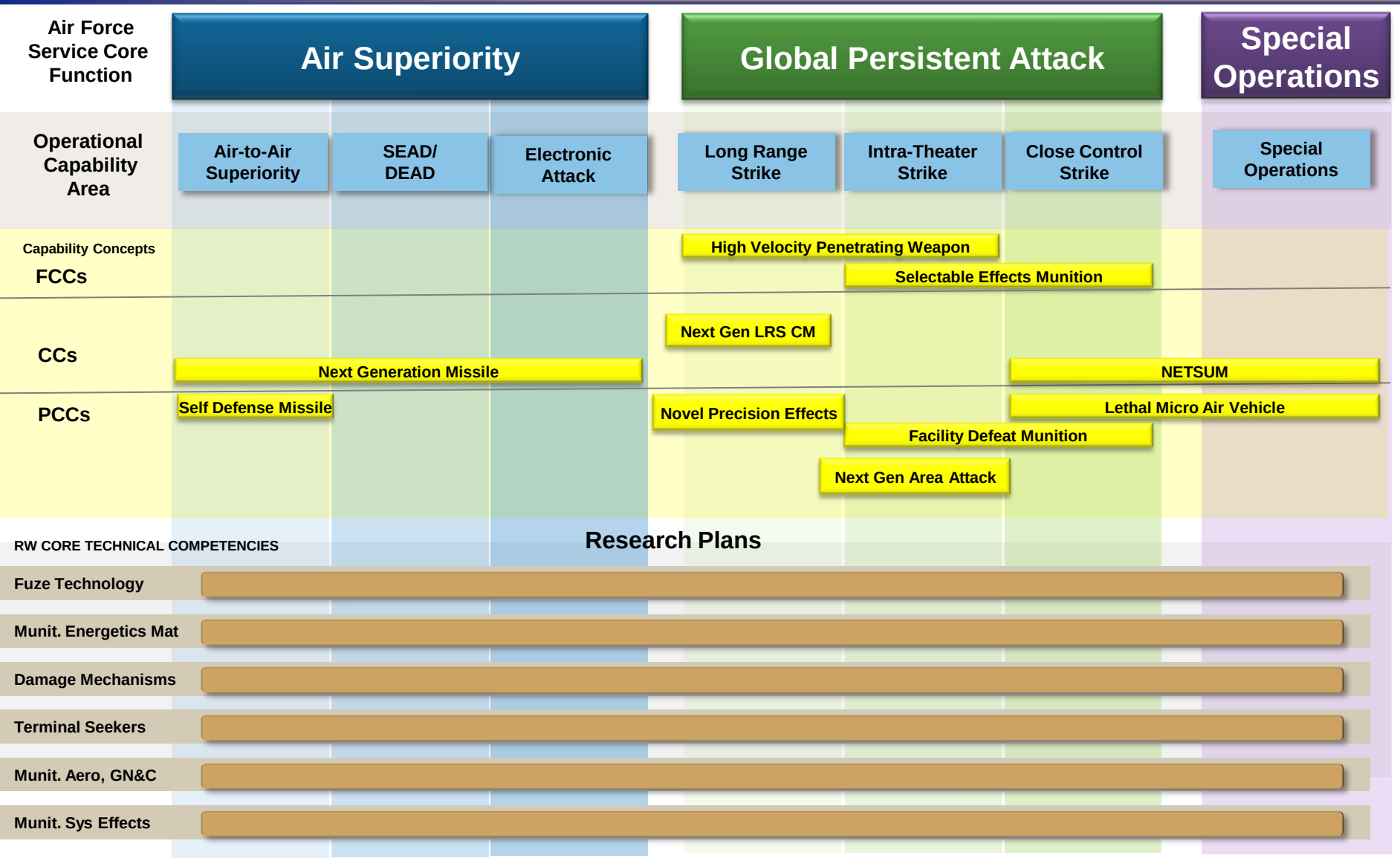


Munitions Aero, GN&C

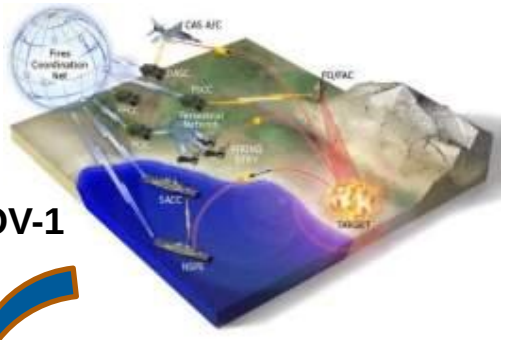
Munitions Systems Effects

Terminal Seekers

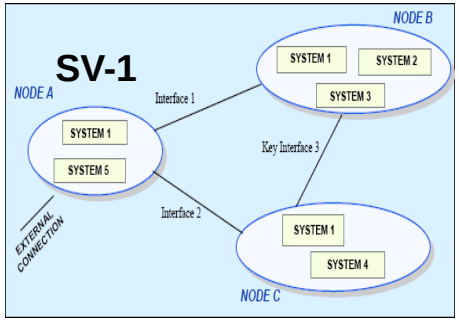
Mapping Capability Concepts & CTCs to the AF Mission

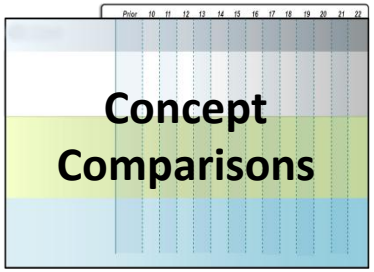


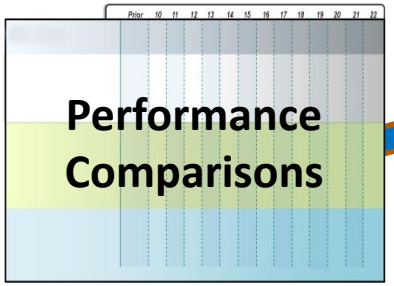
Capability Development Planning

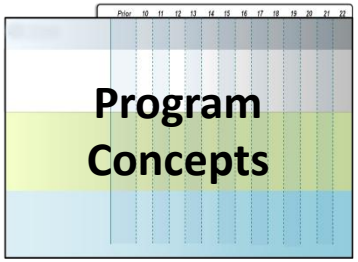


OV-1



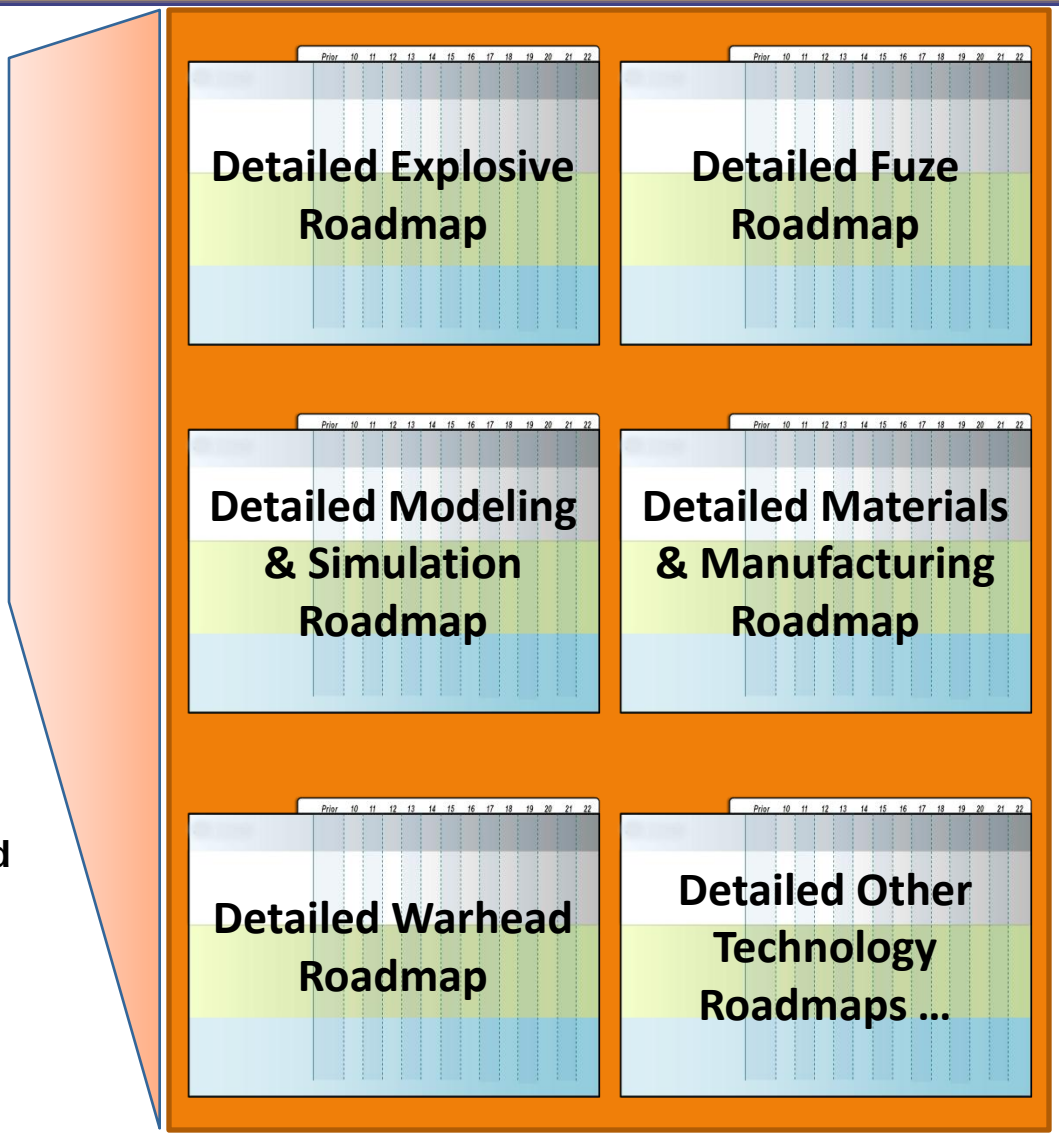






- Operational Capability Area (OCA) lead oversees the OCA for RW
- OCA Integrated Product Team (IPT) reviews gaps and needed weapon attributes
- OCA IPT develops concept trade space including rough cost & schedule estimates
- Stakeholder meetings/analyses
- Capability Concept Refinement
- Re-Engage Munitions Stakeholders
- Develop and coordinate collaborative roadmap

Capabilities to Technical Challenges & Approaches



- Increase fidelity of technical challenges that have to be overcome to enable concept - down to sub-component area (Research Plan)
- Estimate program cost & schedule based on desired maturation dates
- Re-Engage Munitions Stakeholders
- Allocate Available Resources
- Update Research Plans & Roadmaps
- Execute Work Units

Munitions Directorate Collaboration

Dept of Defense

International

Industry

Academic

AFRL/RW Industry Partnerships

Title	Company	Technology Challenge
Development of a Penetration Shock Accelerometer Data Acquisition / Decision Making Module	Kaman Aerospace Corporation	Munitions Systems Effects
Demonstration of Active Millimeter Wave Radar Technology	UBC Inc	Munitions Aero, GN&C
Quint Networking Technology (QNT)	Lockheed Martin Corporation	Terminal Seekers
2-Color Ambient IR Scene Projection System	Lockheed Martin Corporation	Munitions Aero, GN&C
RDT&E of Communication and Networking	L-3 Interstate Electronics Corporation	Terminal Seekers
KDI ESAF Sled Test	KDI Precision Products Inc	Fuze Technologies
RDT&E of Communication and Networking Technologies	Rockwell Collins Inc	Terminal Seekers
RDT&E of GPS and Navigation Technologies	L-3 Interstate Electronics Corporation	Munitions Aero, GN&C
MMW Seeker Technology	Lockheed Martin Corporation	Terminal Seekers

AFRL/RW Industry Partnerships (Cont.)

Title	Company	Technology Challenge
Millimeter Wave Advanced Search and Strike (MASS)	Raytheon Missile Systems	Terminal Seekers
Air Launched Hit to Kill Modeling and Simulation Kill Chain Analysis	Raytheon Missile Systems Air Armament Center (AAC/XR)	Munitions Systems Effects
Structural Energetic Technology Development	Boeing Company	Energetic Materials
Moving Target Strike (MTS)	General Atomics Aeronautical Systems	Munitions Aero, GN&C
Tri-Mode Seeker Technology	Lockheed Martin Corporation	Terminal Seekers

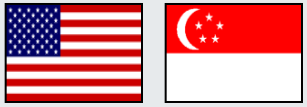
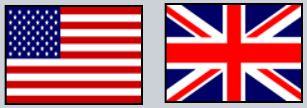
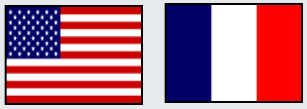
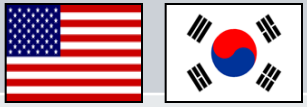
AFRL/RW Academia Partnerships

Title	Academia	Technology Challenge
OASIS 512 Array Test and Packaging	John Hopkins University	Munitions Aero, GN&C
NODDS PACE Development	MIT	Munitions Aero, GN&C

AFRL/RW SBIRs

Title	Firms Involved	Technology Challenge
GPS Degraded and/or Denied Precision Navigation for Munitions	Nu Trek, California Physical Optics Corporation, California	Guidance and Avionics Control
Hypervelocity Aerodynamic Interaction of Ballistic Bodies (AIBB)	CFD Research Corporation, Alabama Kord Technologies, Alabama	Aerodynamics Sciences
Cumulative Structural Damage from Multiple Weapons	Karagozian and Case, California	Fixed Target Lethality
Navigation and Orientation Determination Advanced Research and Development	Microcosm, Inc. California ImSAR, LLC, Utah	Guidance and Avionics Control
Predicting Structural Debris and Secondary Air Blast	Karagozian and Case, California ACTA, Inc. California	Fixed Target Lethality
Strapdown Wide-Field-of-Vie (WFOV) Closed Loop Guidance	Cyan Systems, California Spectral Imaging Laboratory, California	Seeker Sciences
Munitions Effects on Building Infrastructure Components	ACTA, California Baker Engineering and Risk Consultants, Texas	Fixed Target Lethality
Innovative Micro-munition Electrical Interface Physical Interconnection Alternatives	WINTEC, Inc. Florida Luna Innovations Inc. Virginia	Aerodynamics Sciences
Layered Sensing Bio-Signatures for Dismount Tracking	Toyon Research Corp, California Photon-X, Inc, Alabama	Seeker Sciences

AFRL/RW International Partnerships

Title	Countries Involved	Technology Challenge
(TTCP) WPN AG-25 (Weapon Action Group 25)	 US, Canada, Australia, UK, New Zealand	Mapping Current Weapon Technologies to find areas of Mutual Interest
Seeker Performance and Design Environment (SPADE)	US & Australia 	Guidance
Insensitive High Explosives for High Speed Penetrators	US & Germany 	Explosive Materials
Synthesis, Formulation & Characterization of Structural Nanoenergetics	US & Singapore 	Explosive Materials
Compact Penetrating Weapon Technologies Covering the Attack & Defeat of Hardened Targets	US & UK 	Energetic Materials
Mutual Weapons Development Master Data Exchange Agreement	US & France 	Models & Vulnerabilities
Conventional Munitions	US & S. Korea 	Warhead Design, Fuzing, Explosive, Modeling & Sim
Measurement of HS Penetration into Sand	US & Japan 	Diagnostics Development for High-Speed Particulate Media Impacts
Image Gyro for Airborne Applications	US & Japan 	Guidance

Summary

- **Munitions technology investment gives high ROI**

- **Mid term munitions outlook characterized by**
  - Increased lethality (per munition and airframe)
  - Persistence
  - Smaller Weapons potential for UAVs
  - Network centric / Cooperative control
  - Low Collateral Damage

- **AFRL/RW relies on partnering to achieve our mission**
  - Growing Revolutionary Technology Initiatives

AFRL Munitions Directorate

http://www.eglin.af.mil/units/afrlmunitionsdirectorate

We Deliver the Warfighter's Best Bang for the Buck !!