AFRL

THE AIR FORCE RESEARCH LABORATORY

LEAD | DISCOVER | DEVELOP | DELIVER

Air Force Fuze Science and Technology

14 May 2008

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Chief Fuze Branch

Munitions Directorate

Agenda

- AF Posture and Vision
- Strategic Planning Process
- AFRL S&T Strategic Vision
- RW Mission and Objectives
- Summary

Air Force Vision 2020

Global

Vigilance | **Reach** | **Power**

AFRL Strategic Vectors

Strategic Vectors

- Universal Situational Awareness
- Access and Survive in the Battlespace
- Deliver Precision Effects

Julius Caesar's Vision

Julius Caesar - 47 BC

Veni	Vidi	Vici
I came	I saw	I conquered

Restatement of Concepts

AFRL Strategic Vectors

- Universal Situational Awareness
- Access and Survive in the Battlespace
- Deliver Precision Effects

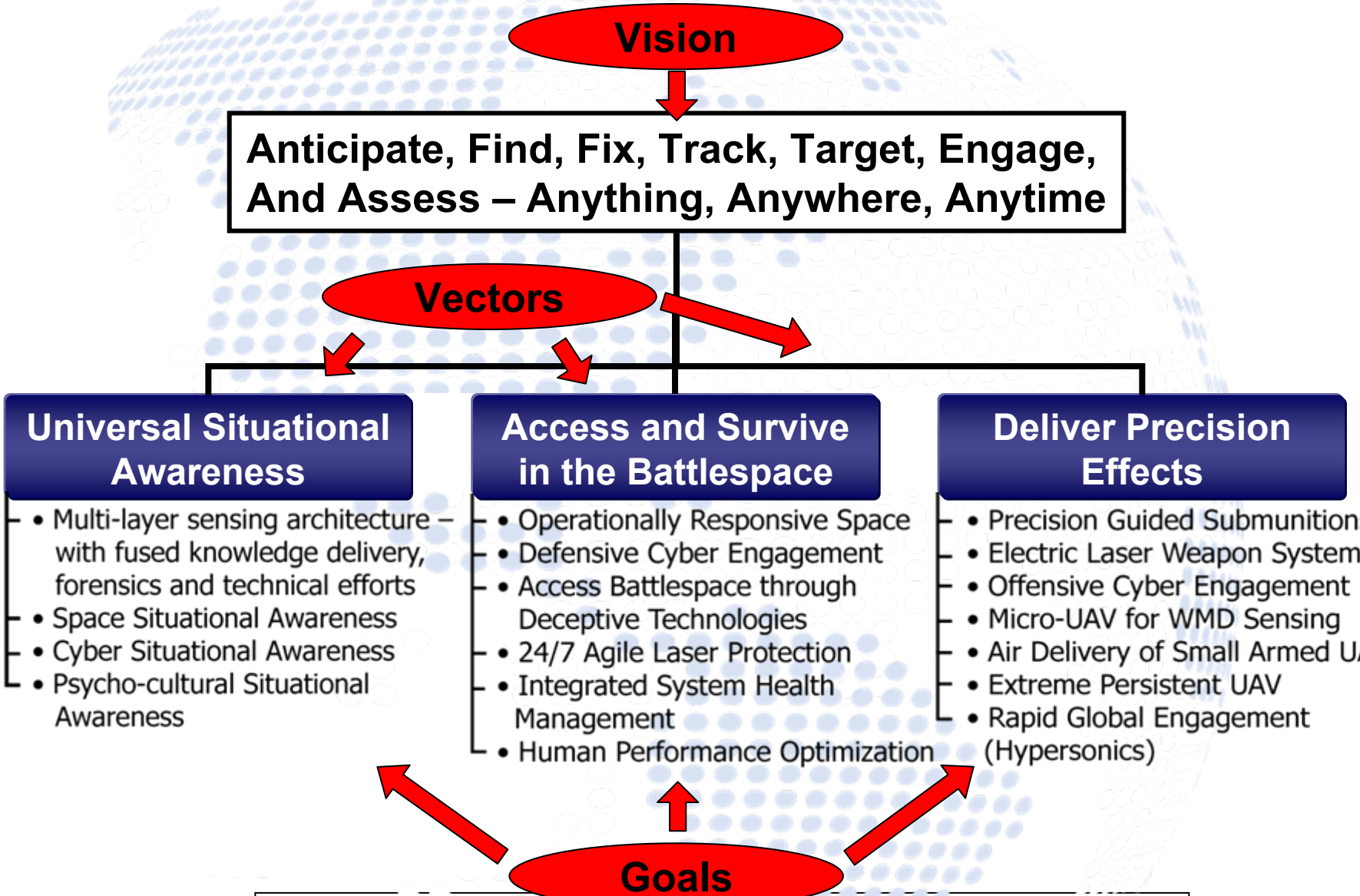
Air Force Vision

- Global Vigilance
- Global Reach
- Global Power

Julius Caesar - 47 BC

- Veni (I came)
- Vidi (I saw)
- Vici (I conquered)

AFRL S&T Strategy



AFRL S&T Strategy

Anticipate, Find, Fix, Track, Target, Engage, And Assess – Anything, Anywhere, Anytime

Universal Situational Awareness

- Multi-layer sensing architecture – with fused knowledge delivery, forensics and technical efforts
- Space Situational Awareness
- Cyber Situational Awareness
- Psycho-cultural Situational Awareness

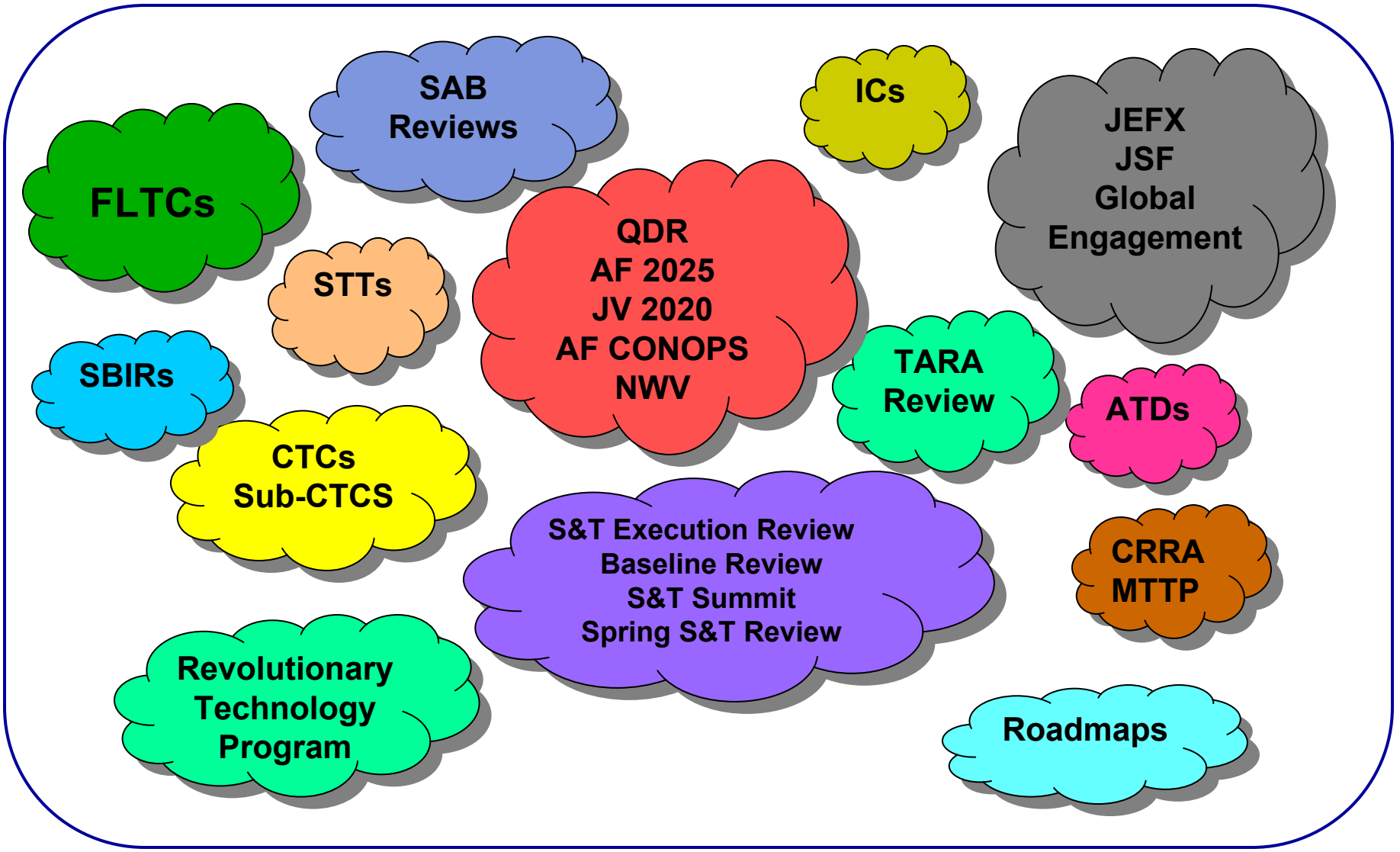
Access and Survive in the Battlespace

- Operationally Responsive Space
- Defensive Cyber Engagement
- Access Battlespace through Deceptive Technologies
- 24/7 Agile Laser Protection
- Integrated System Health Management
- Human Performance Optimization

Deliver Precision Effects

- Precision Guided Submunitions
- Electric Laser Weapon System
- Offensive Cyber Engagement
- Micro-UAV for WMD Sensing
- Air Delivery of Small Armed UAVs
- Extreme Persistent UAV
- Rapid Global Engagement (Hypersonics)

Strategic Planning



AFRL/RW Key Technology Areas

Deliver Precision Effects

- Precision Guided Submunitions
- Electric Laser Weapon System
- Offensive Cyber Engagement
- Micro-UAV for WMD Sensing
- Air Delivery of Small Armed UAVs
- Extreme Persistent UAV
- Rapid Global Engagement (Hypersonics)

Key Technology Areas

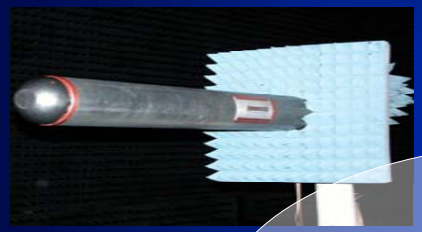
- Micro-Munitions
- Dial-a-yield
- Bio-mimicry
- Hard & Deeply Buried Targets (HDBT)
- Hypersonics
- Joint Dual Role Air Dominance Missile (JDRADM)
- Chemical, Biological, Radiological, Nuclear & Explosive (CBRNE) Defeat

AFRL/RWMF Technology Thrusts

Micro-Munitions	Miniature & Micro-Safe & Arm
Dial-a-yield	Software Defined Safe & Arm
Joint Dual Role Air Dominance Missile (JDRADM)	Novel Initiation
	Multiple point/function Initiation
Bio-mimicry	Active Imaging Target Detection Device
Hard & Deeply Buried Targets (HDBT)	Guidance Integrated Fuzing
	Bio-Inspired Target Detection Device
Hypersonics	Shock Hardened electronics
Chemical, Biological, Radiological, Nuclear & Explosive (CBRNE) Defeat	Non-inertial void detectors
	Shock mitigating Technologies

Fuzes Vision

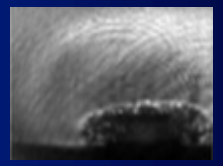
Discover, Develop, Integrate, and Transition Science and Technology For Fuzing of Air-Delivered Munitions that Maximize Weapon Effectiveness




Point Burst

Advanced Initiation

Experimentation



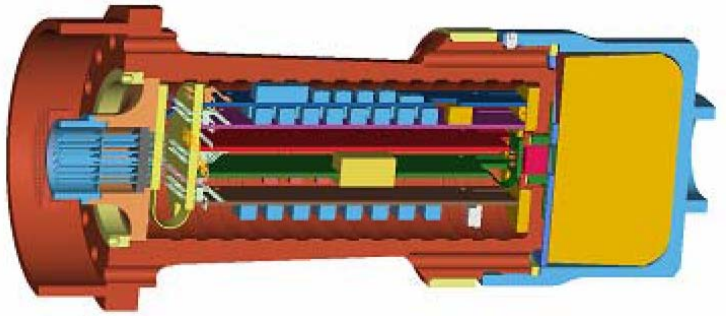
Penetration

Fuze Computational Model




Robust Intelligent Void And Layer (RIVAL) Fuze

AFRL/RW



Technology Development Tasks

Req'mts Def./Survivability Eval.

Fuze Design

Fuze Build and Lab Test

Government Sled Testing

Tech Availability at TRL=6

Description

Advance/demonstrate fuze technology for hard target defeat by repackaging current hardened state-of-the art intelligent fuze electronics into a three-inch form factor

Technology

- Shock Hardened Electronics
- Intelligent Post-Impact Algorithm

Benefits to the WarFighter

- Compatible with legacy penetrators.
- Compatible with existing guidance kits for precision delivery
- Ability to reach hardened and deeply buried targets which cannot currently be reached.
- Fuze capable of void, layer and depth of burial (DoB) modes of operation.

Harsh Environment Fuze Technology (HEFTY)

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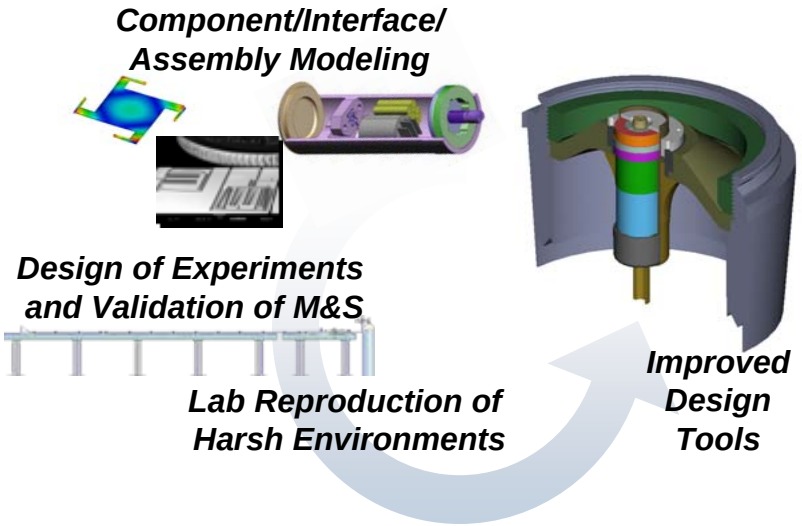


Technology Development Tasks

Impact Test with 1.5” Hopkinson Bar

Create Opposing loads with Vacuum Gun

Quantify Test Articles and Full-Scale Weapons (Reverse Ballistics)

Modeling

Description

Develop the capability to model, characterize, design, and test fuzes and fuze components in harsh environments based on requirements for current and future munitions.

Technology

Survivable fuze technology
Validated M&S of fuzewell environment
Model-based design of experiments
Scaling of models for harsh environment prediction
Dynamic test apparatus and methodology

Benefits to the War Fighter

- Enhanced fuze reliability and performance in harsh environments of Global Strike weapons
- Supports Global Attack capability (Time Critical Targets)- Planning hi-velocity follow-on FY12+
  - High speed boost-glide penetrating weapons
  - Hold high value, time-critical targets at risk
- Provide M&S and Test methodologies to Industry

Modular Fuze Architecture

MAFIA : Modular Advanced Fuze Interface Architecture

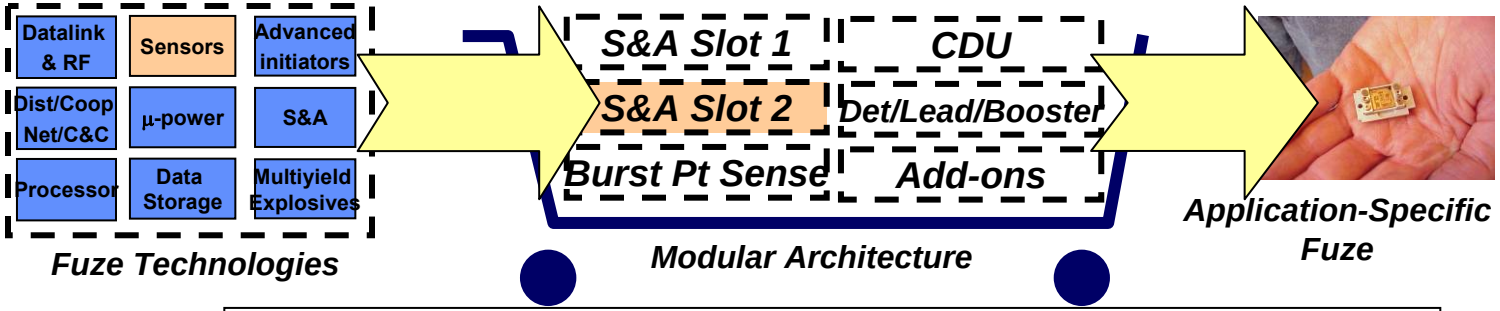
Benefits

- Modular Open Systems Approach (MOSA)
- Faster, lower cost weapons systems integration
  - "Plug and play" compliant warheads
  - Service and CTR mix-n-match
    - Multiple subs for multiple modules
    - Army vs. Navy vs. AF core competency
  - Predicted improvement in "-ilities"
    - Affordability, Reliability, etc.
- Piecewise capability development
  - Incremental acquisition strategy
  - Modular capability becomes "COTS" for integration

Approach

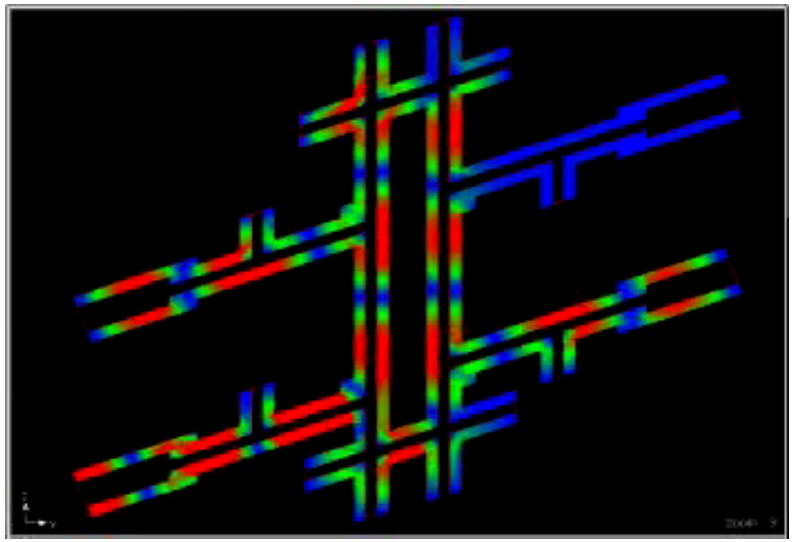
Design & Promote Modular Fuze Architecture By:

- Providing an enabling environment
  - Joint advocacy through FESWG, etc.
  - Minimum Qualifications For Tri-Service Requirements
- Parsing Fuzing System Functional Allocations
  - Communication, Safety, TDD
- Determining/Defining Interfaces
  - Interface Control Document (ICD) Style
  - Establish Rules/Conditions That Can Allow "Plug & Play" Functionality
- Determine Certification, Conformant, Metrics
- Support Legacy Weapon Systems (If Reasonable)



Sub-millimeter Wave Imaging Fuze Technology (SWIFT)

AFRL/RW



Technology Development Tasks

Contract Award 2QFY09

Breadboard Design Complete

Breadboard Fabrication

Refine Hardware Model

Field Testing Completed

Description

Develop a Miniature, High-Speed, Imaging Fuze Sensor that Performs Target Detection, Classification, and Aimpoint Selection for Mass-Focused Ordnance Concepts Used with Smaller Munitions

Technology

- Radar Components for >200 GHz Operation
- Miniature Conformal Antennas
- Coherent Software Defined Fuze Radar
- Validated Target & Background Measurements

Benefits to the War Fighter

- Reduction in Fuze Radar Aperture
  - Ideal For Miniature Munitions
  - More Easily Integrated with Guidance
- Enables Mass Focused Warhead Concepts with Increase in Fragments on Target
- Easier Detection of Targets
- Low Probability of Intercept
- Common Fuze Sensor Hardware for Dual-Role Munitions – Air-Surface and Air-Air Applications

Summary

- Munitions Directorate mission objectives align our thrusts with the Air Force's S & T strategy
- Fuze Branch's technology focus addresses seven major areas:
  - Micro-munitions
  - Dial-a-yield
  - Bio-mimicry
  - CBRNE defeat
  - Hypersonics
  - JDRADM
  - HDBT
- Your role is critical in achieving our organization's success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