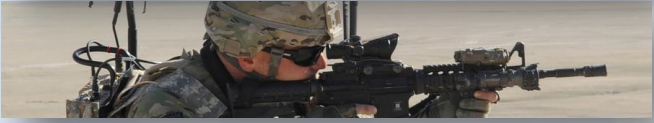


Army Science & Technology



NDIA Science Engineering & Technology Conference

Air Portfolio Overview



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Director Air Portfolio
Office of the Deputy Assistant Secretary
of the Army for Research and Technology

9 April 2014

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DESIGN • DEVELOP • DELIVER • DOMINATE
SOLDIERS AS THE DECISIVE EDGE



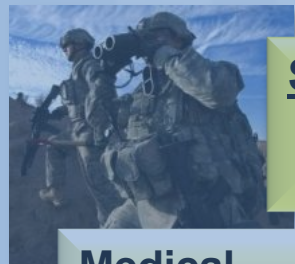
Army Enduring Challenges

- Greater **force protection (Soldier, vehicle, base)** to ensure survivability across all operations
 - Ease **overburdened** Soldiers in Small Units
 - Timely **mission command & tactical intelligence** to provide situation awareness and communications in all environments
 - Reduce logistic burden of **storing, transporting, distributing** and **retrograde** of materials
 - Create **operational overmatch** (enhanced lethality and accuracy)
- Achieve operational **maneuverability** in all environments and at **high operational tempo**
 - Enable ability to **operate in CBRNE environment**
 - Enable **early detection and improved outcomes for Traumatic Brain Injury (TBI) and Post Traumatic Stress Disorder (PTSD)**
- Improve **operational energy**
 - Improve **individual & team training**
- **Reduce lifecycle cost** of future Army capabilities



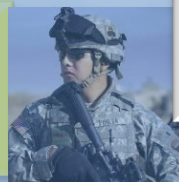
Army S&T Investments by Portfolio

PB15 FY15 6.1-6.3



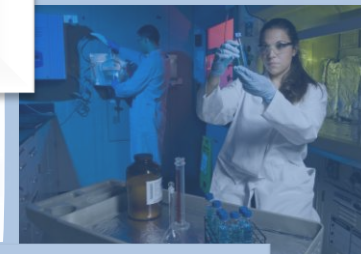
Soldier/Squad

Soldier survivability equipment; human dimension/systems; power & energy; Soldier Weapons, training



Air

Advanced air vehicles; aircraft and occupant survivability; manned/unmanned teaming

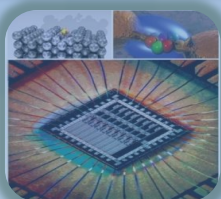


Medical

Combat Casualty Care, Infectious Disease mitigation, clinical/rehabilitative medicine

Innovation Enablers

High Performance Computing; Environmental Protection; Base Protection; Studies



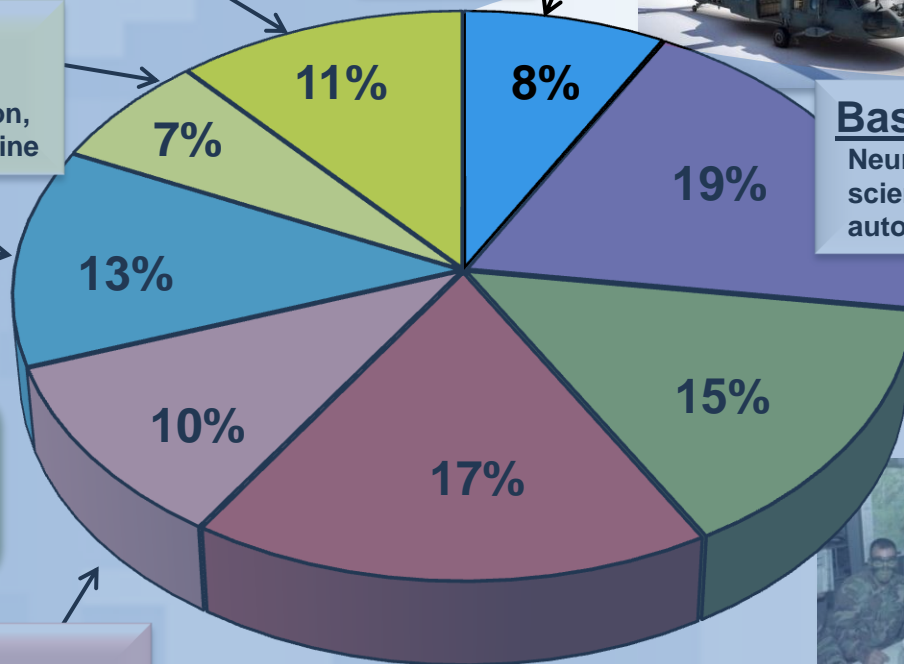
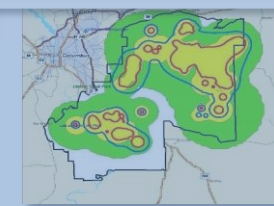
Basic Research

Neuroscience; network science, materials science; autonomy



C3I

Secure Comms-on-the-move; cyber/EW; sensors



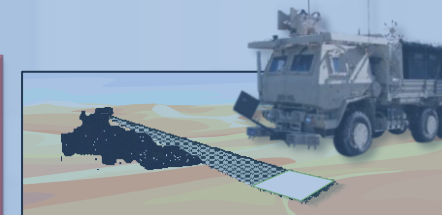
Lethality

Offensive/Defensive kinetic (guns, missiles) > 50 cal; Directed Energy (HEL) weapons



Ground Maneuver

Combat/tactical ground platforms/survivability; unmanned ground systems; austere entry; power & energy



Note: Figures may not add due to rounding

MAINTAINING A LEADING EDGE IN TECHNOLOGY

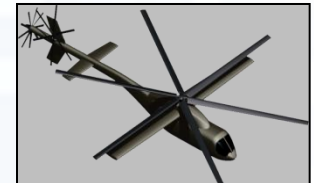
Air Portfolio Vision/Mission Statement

Vision

Be the global leader in providing game-changing range, payloads, speed, survivability and lethality to maintain U.S. technical superiority and combat overmatch for vertical lift aviation systems

Mission Goals

- Longer Persistence
- Longer Range
- Larger Payload
- Increased Speed
- Combat Overmatch
- Battlefield Dominance
- Lower Cost of Ownership



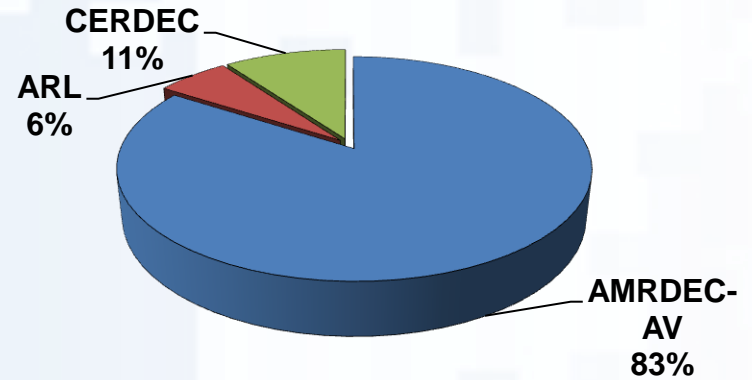
Best technology for current and future platforms at the right time at an affordable cost



Air Portfolio

Air Portfolio 6.2 and 6.3 Funding

\$176M



Platform Design & Structures

\$66M

Engines & Drive Trains

\$22M

Aircraft & Occupant Survivability

\$31M

Maintain & Sustainability

\$9M

Rotors & Vehicle Management

\$13M

Aircraft Weapons & Sensors

\$14M

Unmanned & Optionally Manned Systems

\$21M

Investment Areas

- Adv Aircraft Design
- Structures
- National Rotorcraft Tech Center

Investment Areas

- Engines
- Drive Trains

Investment Areas

- Degraded Visual Envrmt
- Sig Mgmt
- Threat Warning & Jammers
- Vehicle Hardening

Investment Areas

- Health Usage Monitoring

Investment Areas

- Rotors
- Vehicle Management Systems

Investment Areas

- Sensors
- Weapons
- Displays

Investment Areas

- Autonomy
- Human/Machine Interface
- Unmanned Aerial Vehicle Sensors



Air S&T Strategy

Goal: Provide game-changing range, payloads, speed, and survivability for vertical lift aviation systems

Key Research Areas

- **Advanced aircraft design**
- Advanced power systems
- Integrated aircraft survivability equipment architectures
- **Degraded Visual Environment Mitigation (DVE)**
- Maintainability and Sustainability
- High performance rotors
- Vehicle management systems
- Autonomy – teaming and human machine interface



High Performance Rotors



DVE Mitigation



Advanced Aircraft Design and
Advanced Power Systems

Drivers

- **Army Strategic Planning Guidance**
- **Army Enduring Challenges**
- **Future Vertical Lift Family of Systems Initial Capabilities Document**
- **Strategic Plan for DoD Vertical Lift Aircraft**
- **OSD Study on Rotorcraft Survivability**

Air Major Efforts

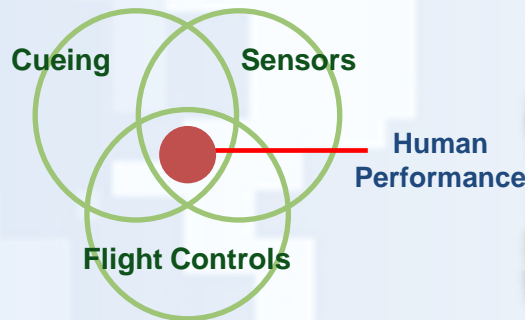
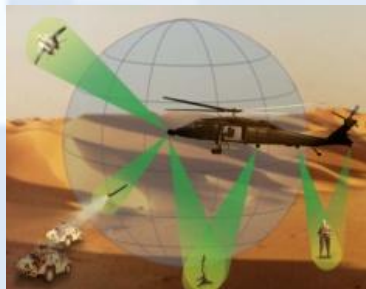
Advanced Aircraft Design

Capability to Perform Worldwide Operations



Goal: Design, develop, and demonstrate next generation technologies to provide unmatched vertical lift aircraft performance to meet future operational capabilities.

Degraded Visual Environment Mitigation



Goal: Demonstrate multi-sensor fusion, flight controls upgrades and advanced pilot cueing (symbology, tactile & aural) in order to increase rotorcraft capability in degraded visual environments

Major Effort: Joint Multi-Role Technology Demonstrator



Demonstrate transformational vertical lift capabilities to prepare the DoD for decisions regarding the replacement of the current vertical lift fleet

Capability to Perform Worldwide Operations



Leverages ongoing work in materials, sensors, communications, human factors, propulsion and vehicle management systems from multiple portfolios and organizations

Program Provides:

- Two demonstrator aircraft
- Mission systems architecture laboratory demonstration
- Demonstration, evaluation and maturity assessment of enabling technologies to reduce program of record risk
- Skill sets and tools required to design, analyze, predict, and evaluate the next generation rotorcraft
- Cost/value analysis of potential aircraft configurations to inform Analysis of Alternatives
- Informed, refined and validated representative future requirements

Warfighter Payoff:

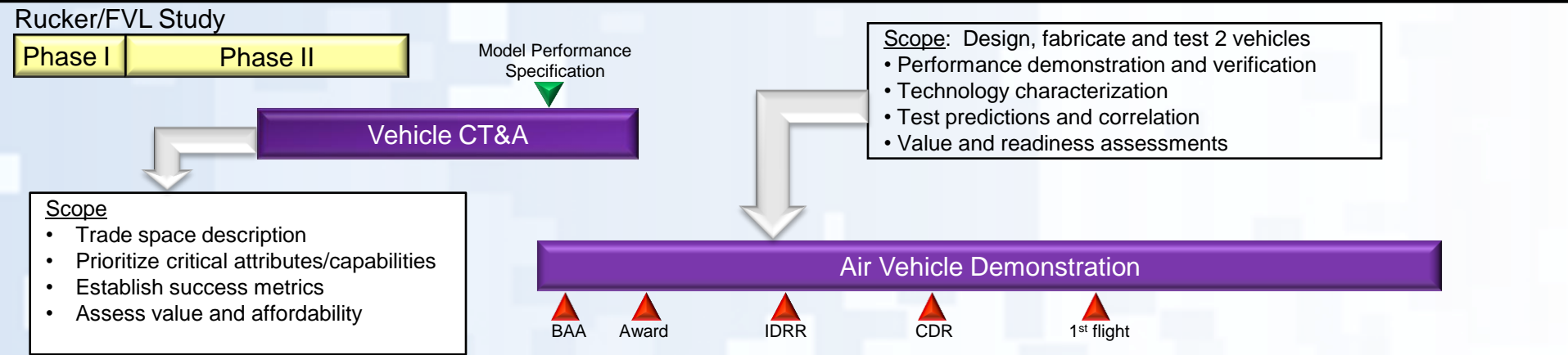
- Increased speed, range and on-station time to deliver troops, weapons and sensors on target
- Increased Warfighter survivability
- Reduced maintenance burden at increased OPEMPO





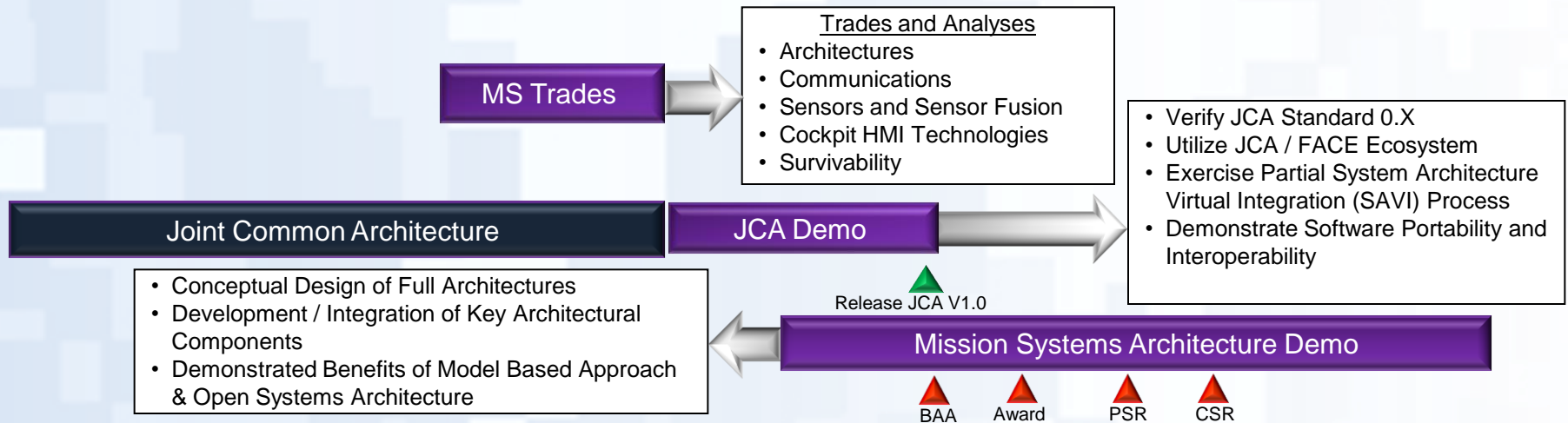
JMR TD Schedule Overview

FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
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Maturation of flight performance technologies; operational assessment of advanced configurations

Industry research for effectiveness trades; demo of JCA concept and representative architecture design



Joint Multi-Role Technology Demonstrator Air Vehicle Status



- **Purpose:** Flight Demonstrate transformational vertical lift platform capabilities to prepare the DoD for decisions regarding the replacement of the current vertical lift fleet
- **4 Air Vehicle Technology Investment Agreements (TIAs)** were awarded on September 27, 2013 for the design, fabrication, and test of vehicle demonstrators. Demonstrators will include missions systems required for flight
- **Contractors:**
 - AVX Aircraft Company
 - Bell Helicopter
 - Karem Aircraft, Inc.
 - Sikorsky/Boeing
- **Path forward**
 - FY14 – concept design
 - FY14 – down select to 2 contractors to build demonstrators
 - FY17-19 – Flight demonstration



AVX



Bell



Karem



Sikorsky/Boeing



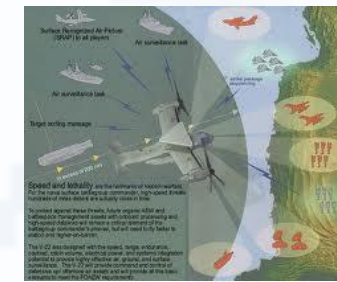
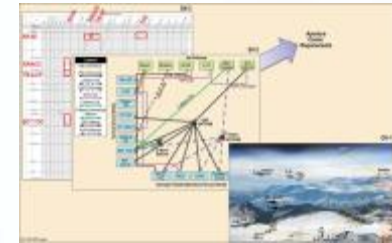
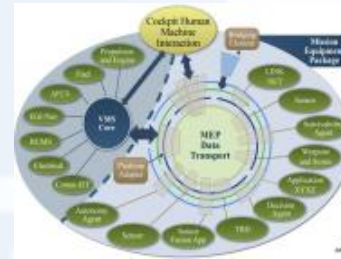
JMR TD Mission Systems Architecture Status

- Purpose: Lab demonstrate tools, information and processes for mission system design and implementation
- Mission Systems Effectiveness and Trade Analysis Complete 4th QTR FY13

- Rockwell Collins
- Boeing
- Honeywell
- Lockheed Martin
- Sikorsky
- SURVICE Engineering

• Path forward

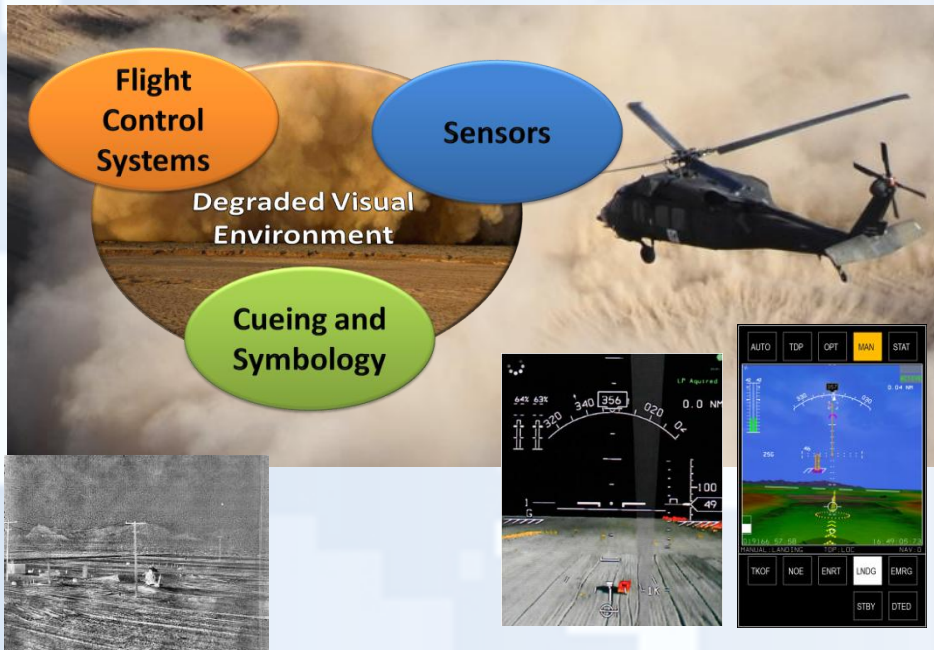
- Joint Common Architecture Demonstration
 - 2nd QTR FY14 - BAA
- Mission Systems Architecture Demonstration
 - 2nd QTR FY15 - BAA (Anticipate two awards)
 - FY19 - Demonstrate in laboratory environment



Major Effort: Rotorcraft Degraded Visual Environment (DVE) Mitigation



Increase rotorcraft capability in degraded visual environments through a collaborative, synchronized S&T program that will develop & demonstrate multi-sensor fusion, flight controls upgrades and advanced pilot cueing (symbology, tactile & aural)



Program Provides:

- Enhanced flight control logic and hardware upgrades to reduce pilot workload
- Sensor technology and multi-sensor fusion to provide “see-through” obstacle warning and threat warning capability in all DVE environments
- Advanced cueing (symbology, tactile and aural)
- Integration and demonstration of DVE mitigation technologies

Warfighter Payoffs:

- Enhanced survivability
- Capability to conduct rotorcraft missions in all environments



Degraded Visual Environments

Aircraft Induced DVE

Brownout



Whiteout



DVE – Reduced visibility of potentially varying degree, wherein situational awareness and aircraft control cannot be maintained as comprehensively as they are in normal visual meteorological conditions and can potentially be lost.

Aircraft Independent Degraded Visual Environments

Smoke



Sand / Dust



Fog



Rain



Clouds



Snow



Smog



Night



Flat Light



“We own the night,...” but what about the other DVEs?

DVE... More than Just Brownout

Rotorcraft Degraded Visual Environment S&T Development Timeline



Increment 1

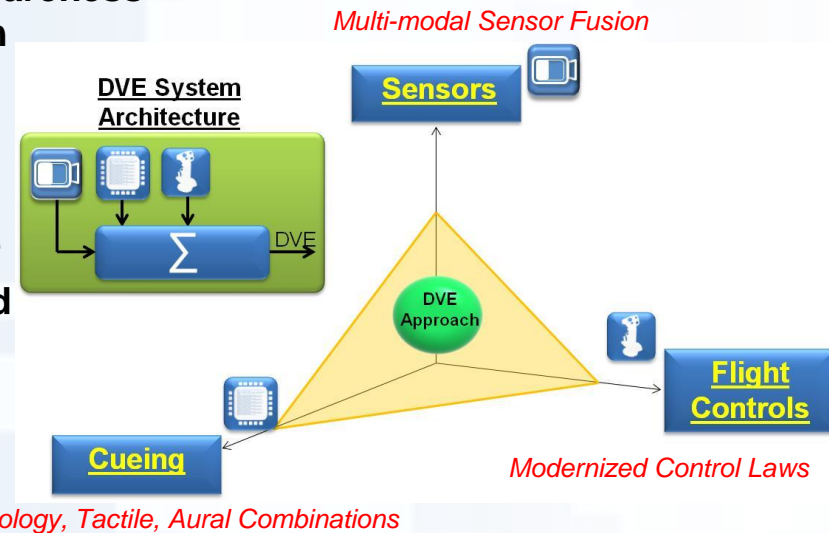
- Flight Regimes: Take Off, Landing (limited hover, ground taxi)
- Capability: Forward looking pilotage system, terrain awareness and warning, hazard avoidance, sensor, synthetic vision
- DVE: Brownout conditions

Increment 2

- Flight Regimes: Take Off, Taxi, Hover, Landing, Enroute
- Capability: Forward looking pilotage system and hazard avoidance, 360° hazard warning, synthetic vision, sensor(s)
- DVE: All Conditions (i.e. all weather)

Increment 3

- Flight Regimes: Formation (i.e. multi-ship)
- Capability: Forward looking pilotage system and hazard avoidance, 360° hazard warning, networked real-time situational awareness, synthetic vision, sensor(s)
- DVE: All Conditions (i.e. all weather)



	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20
Sensors			Performance Spec			Begin Integration		
Cueing		Sim Test		Sim Test	Sim Test			
Flight Controls	V2		V3		V4		V5	
Demonstration		Inc 1+ Flight Demonstration						Inc 2+ Flight Demo

V2 = hover low speed
 V3 = forward flight low speed, landing
 V4 = forward flight cruise speed, landing
 V5 = coupled, autonomy





Summary

- Portfolio supports the current and future fleet
- Major Efforts and Opportunities:
 - Advanced vertical take-off and landing platform technology
 - Degraded visual environment mitigation technology
 - Communication-Electronics Research Development and Engineering Center

www.cerdec.army.mil/opportunities_and_services/business_opportunities/



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For Industry, to learn about Department of Defense (DoD) S&T/R&D investment priorities, capability needs and technology interchanges.

For Government, to [access search tools](#) to assess and then leverage industry IR&D projects for current and future programs.

"We also have the Defense Marketplace, which is a website that we allow industry to identify IR&D opportunities... that we can then leverage."

Mary Miller, Deputy Assistant Secretary of the Army for Research & Technology

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Strategic Documents	Doing Business with DoD	News & Events
<ul style="list-style-type: none"> Systems Engineering 2013 Annual Report **NEW** DoD's FY15 S&T Testimony Chairman's 2nd Term Strategic Direction Expeditionary Forces Capstone Concept Reliance 21 Operating Principles <p>More...</p>	<ul style="list-style-type: none"> DARPA Hand & Touch Interfaces (HAPTIX) Proposer's Day **NEW** DARPA Upward Falling Payloads **NEW** Navy Optical Telescope Assembly BAA **NEW** DARPA Tactical Boost Glide BAA <p>More...</p>	<ul style="list-style-type: none"> Aerospace Enterprise Dialogue with Industry Wright Dialogue with Industry DAU March Newsletter Top Downloads February Army Technology Magazine Defense AT&L Magazine <p>More...</p>

Updated 3/31/14

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