Air Portfolio Overview

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

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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

**Ground Maneuver**
- Combat/tactical ground platforms/survivability
- Unmanned ground systems
- Austere entry
- Power & energy

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

**Medical**
- Combat Casualty Care
- Infectious Disease mitigation
- Clinical/rehabilitative medicine

**Soldier/Squad**
- Soldier survivability equipment
- Human dimension/systems
- Power & energy
- Soldier Weapons, training

**Air**
- Advanced air vehicles
- Aircraft and occupant survivability
- Manned/unmanned teaming

**Basic Research**
- Neuroscience
- Network science
- Materials science
- Autonomy

**Innovation Enablers**
- High Performance Computing
- Environmental Protection
- Base Protection
- Studies

**C3I**
- Secure Comms-on-the-move
- Cyber/EW
- Sensors

Note: Figures may not add due to rounding
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

6.2 and 6.3 Funding

$176M

Investment Areas
- Engines
- Drive Trains

Investment Areas
- Degraded Visual Env
- 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

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

FY15

CERDEC 11%
ARL 6%
AMRDEC-AV 83%
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

### 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**

**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 multisensor fusion, flight controls upgrades and advanced pilot cueing (symbology, tactile & aural) in order to increase rotocraft 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

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 OPTEMPO

Leverages ongoing work in materials, sensors, communications, human factors, propulsion and vehicle management systems from multiple portfolios and organizations
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**Rucker/FVL Study**

**Phase I**
- Trade space description
- Prioritize critical attributes/capabilities
- Establish success metrics
- Assess value and affordability

**Phase II**

**Vehicle CT&A**

**Air Vehicle Demonstration**

- **Scope**: Design, fabricate and test 2 vehicles
  - Performance demonstration and verification
  - Technology characterization
  - Test predictions and correlation
  - Value and readiness assessments

**MS Trades**

**Joint Common Architecture**

**JCA Demo**

**Mission Systems Architecture Demo**

- **Trades and Analyses**
  - Architectures
  - Communications
  - Sensors and Sensor Fusion
  - Cockpit HMI Technologies
  - Survivability

- **Release JCA V1.0**

- **Demonstrate**
  - JCA Standard 0.X
  - Utilize JCA / FACE Ecosystem
  - Exercise Partial System Architecture Virtual Integration (SAVI) Process
  - Demonstrate Software Portability and Interoperability

**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
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
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

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)
Degraded Visual Environments

Aircraft Induced DVE
- Brownout
- Whiteout

Aircraft Independent Degraded Visual Environments
- Smoke
- Sand / Dust
- Fog
- Rain
- Clouds
- Snow
- Smog
- Night
- Flat Light

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.

“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)

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<td>Begin Integration</td>
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<td>Cueing</td>
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<td>Sim Test</td>
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<tr>
<td>Flight Controls</td>
<td>V2</td>
<td>V3</td>
<td>V4</td>
<td>V5</td>
<td>V2 = hover low speed</td>
<td>V3 = forward flight low speed, landing</td>
<td>V4 = forward flight cruise speed, landing</td>
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### Diagram:
- **Multi-modal Sensor Fusion**
- **Sensors**
- **Flight Controls**
- **Cueing**
- **Symbology, Tactile, Aural Combinations**
- **Modernized Control Laws**
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
Defense Innovation Marketplace

The Defense Innovation Marketplace is a centralized resource for market research:

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

NEW IN THE MARKETPLACE

Strategic Documents
- Systems Engineering 2013 Annual Report **NEW**
- DoD’s FY16 S&T Testimony
- Chairman’s 2nd Term Strategic Direction
- Expeditionary Forces Capstone Concept
- Reliance 21 Operating Principles

Doing Business with DoD
- 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 More...

News & Events
- Aerospace Enterprise Dialogue with Industry
- Wright Dialogue with Industry
- DAU March Newsletter
- Top Downloads February
- Army Technology Magazine
- Defense AT&L Magazine

Updated 3/31/14

INNOVATION OPPORTUNITIES

Resources for Industry
DoD Info for Business & Program Planning

Submit IR&D Data
Share projects with DoD Customers

Resources for DoD
DoD employee access of IR&D Search tool

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