Presented at the:
JMR TD Pre-Solicitation Conference
Williamsburg, Virginia

Joint Multi-Role Technology Demonstrator (JMR TD)

Presented by:
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• Today’s meeting provides information relevant to the Joint Multi-Role (JMR) Technology Demonstrator (TD) Phase 1 solicitation
• The solicitation reflects draft Broad Agency Announcement (BAA) and Model Performance Specification (MPS) feedback received to date
• Concerning audience questions today
  – Briefers will answer questions at the end of each presentation, time permitting; these questions and answers will be documented and published on FedBizOpps
  – 3” x 5” cards have been provided for submission of additional questions; answers will also be published in FedBizOpps
• This is a formal contractual meeting
  – Only the briefers have Contracting Officer (KO) approval to answer questions
  – No other Government attendees are authorized to respond to questions
• This is a pre-solicitation conference for the JMR TD, and not a forum to discuss a Future Vertical Lift (FVL) Program of Record (PoR)
  – Dave Weller will brief the status of an FVL PoR
  – He will not field questions following his brief
• The JMR TD program is now entering its third year
• We are funded for the design, fabrication, and test of two Phase 1 demonstrators
• We are executing an aggressive schedule to accomplish Phase 1 awards in FY13
• We have an organization that is working, evolving, and collaborating internally and externally
  – Government design, industry Configuration Trades & Analysis (CT&A), and operations analysis efforts are nearing completion
  – Phase 1 Air Vehicle Demonstration draft documentation has been released through FedBizOpps for industry review
  – Six Missions Systems Effectiveness Trades and Analysis (MS ETA) contracts have been awarded to assist in defining the trade space for Phase 2 Mission Systems Demonstration
• It is our objective to ensure that Industry is fully informed regarding the scope, technical objectives, and expectations of this S&T effort

We’ve had excellent support from Aviation Senior Leadership
The JMR TD is

- An S&T effort
- Joint with critical support provided by the Services, NASA, and OSD
- In lockstep with the requirements community to ensure the relevance of targeted vehicle capabilities and performance
- Supportive of the objectives of a Future Vertical Lift (FVL) Program of Record (PoR)
- A two phase effort
  - Phase 1 Air Vehicle Demonstration
  - Phase 2 Mission Systems Architecture Demonstration

The JMR TD is not

- An FVL prototyping effort
- Indicative of an end state FVL performance requirement
### JMR TD Schedule Overview

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<th>FY09</th>
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#### Rucker/FVL Study

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

**Phase II (Ph II)**

#### Vehicle Trades

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

#### Joint Common Architecture (JCA)

- **Scope:**
  - Develop an avionics reference architecture comprising:
    - Behavior and data models
    - Acquisition and design guidance docs
    - Development / validation ecosystem

#### Mission Systems (MS) Trades

- **Scope:**
  - Instantiate MS architectures based on a unified modeling approach to avionics system development
  - Integrate and evaluate advanced crew station technologies in a relevant environment
  - Explore OPV implications

#### Phase 1

- **Phase 1 Spec**
- **PSR**
- **CSR**
- **1st flight**

#### Phase 2 – Mission Systems

- **Phase 2 Spec**

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**Legend:**
- FY: Fiscal Year
- Ph: Phase
- Spec: Specification
- PSR: Preliminary System Requirements
- CSR: Critical System Requirements
- JCA: Joint Common Architecture
- JCA Demo: Joint Common Architecture Demonstration
- Phase 2 Spec: Phase 2 Specification

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**UNCLASSIFIED**
Configuration Trades & Analysis (CT&A) Methodology

FVL Operational View

- FVL describes a family of vertical lift aircraft
  - Includes multiple sizes/classes of vehicles
  - Considers the vertical lift needs across the DoD
  - Achieves significant commonality between platforms
- Addresses the capability gaps identified in the Aviation Operations CBA, the OSD-sponsored Future Vertical Lift CBA, and the 2010 Air SID gap analysis

Configuration selection
- Advanced Helicopter
- Compound Rotorcraft
- Tilt-rotor

Objective vehicle attributes
- Scalable common core architecture
- Integrated aircraft survivability
- Speed 170+ kts
- Combat Radius 424 km
- Performance at 6,000 feet and 95°F
- Shipboard Compatible
- Fuel Efficient
- Supportable
- Affordability
- Optionally Manned

JMR Design Space Excursion Matrix

Updated JMR Excursion Matrix – 8 September 2011

Unprioritized Attributes

1st Iteration of Vehicle Specification

Conduct Sensitivity Studies and Vehicle Trades

Identify Technology Enablers for Vehicle Demonstration

Model Performance Spec
Industry CT&A Efforts

Tasks

✓ Technology trade study and maturation plan.
✓ Sensitivity analysis that quantifies effects of capability on cost and size and effects of sizing on cost, weight and performance
✓ Assessment of mission equipment packages (MEP) and survivability effects on cost, weight and performance
✓ Design trade study that defines a preferred, affordable Objective aircraft with a feasible set of capabilities
✓ Conceptual design of an Objective aircraft with additional detail for critical elements

6. Conceptual design of a technology demonstrator based on the technology development strategy and with strong, clearly defined linkage to the Objective aircraft

Desired Outcomes

• Result in compelling demonstrators
  – Innovative synthesis of critical design features and technologies
  – Significant improvement of capability/lb
  – Relevant to users and enables (transformational) CONOPS that can't be conducted with current fleet
• Define Technology Maturation Plan
  – Identify S&T investment needed
  – Approach to meeting performance targets and reducing risk/uncertainty
• Inform the requirements community
  – Attribute sensitivity analysis
  – Cost, size, performance predictions of Objective system
  – Explore the possibilities of multi-role and commonality
  – Address scaling of technologies and designs from light and heavy
Government CT&A Efforts

Dismounted Soldier Egress

Altitude (ft)

Best [ISA]

Cruise @ $V_{BR}$

30 min / 10% Fuel Reserves

Drop P/L Loiter Pickup P/L

30 min @ $V_{BE}$ (Loiter)

HOGE 2 min

Primary Design Mission

Dash

HOGE 1 min

Radius

0

324

424 (km)

6,000 [95°F]

5 min (Start Up/Taxi)

Dismounted Soldier

Seated Space

Volume

Armor layout

Survivability Assumptions

- Advanced Helicopter
- Big-Wing Compound
- Advanced Tilt Rotor

Run Dry XMSN

Redundant flight crew - pilot and copilot

Self-sealing, crashworthy fuel bladders

Suction Feed Fuel System

Fly-by-wire flight control system

Redundant hydraulic systems

Concept Design for Dismounted Troop Accommodation

Dismounted Soldier Egress

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Concept Design for Dismounted Troop Accommodation

Approved for public release; distribution unlimited.

UNCLASSIFIED
• Effort performed by USAACE’s Aviation Maneuver Battle Laboratory, Fort Rucker
• Ran helicopter, compound, and tilt rotor models in ATCOM for excursion 1a to support the Phase 1 specification; additional runs of excursion 3a or industry may be performed
• Vignette mission profiles: Reconnaissance and Security, Interdiction Attack, Air Assault, Close Combat Attack, MEDEVAC, and Air Movement
• Findings:
  – The compound helicopter and tilt rotor are more effective than the conventional helicopter across all of the aviation missions studied
  – Faster rotorcraft will require more capable MEP (enroute)
  – Higher speed was most relevant in MEDEVAC, Air Assault/Movement and Close Combat Attack
  – The ability to operate Army aircraft over a broader altitude range presents opportunities to widen the possibilities for executing Aviation missions
• Objective of Phase 1 is to positively impact the FVL materiel solution decision and Technology Development Strategy

• Validate critical technologies and designs at aircraft system level through ground and flight testing to demonstrate vertical lift capabilities superior to those in the current fleet

• Scope
  – Design, build and test two demonstrator aircraft
  – Ground testing to
    o Demonstrate technologies that do not require flight test for demonstration
    o Reduce risk for flight test
  – Flight testing to evaluate components or systems that must be characterized in flight

• Anticipate multiple initial contract awards (depends on funding and quality of proposals)

• Down-select to number that matches funding available after a preliminary design phase
• Background: It is too early to design a mission equipment package (MEP) or mission systems architecture for FVL

• Objective: Provide Future Vertical Lift (FVL) development with the tools, information and processes necessary to design and implement a mission system suite that is effective and affordable

• Approach
  o Collaborate with Government and Industry experts in the areas of:
    • Mission Systems architecture affordability and resiliency
    • Mission Systems effectiveness optimization
    • Optionally Piloted Vehicle (OPV)
  o Develop and validate new approaches through:
    • Analysis
    • Modeling and Simulation
    • Laboratory instantiation and test

Phase 2 focuses on concepts, tools and processes, not an objective design for an FVL MEP or architecture
AMRDEC Tech Feeders
Plus other RDECs and DOD

Scope: Integrated mission system
- Processing
- Network structure
- Integration of hw/sw components

Architecture
- SNAP
- FACE
- JFOWG
- MCAP

Survivability
- MIS
- Adv/Developmental
- CCS
- ASE (PM-ASE)
- ROSAS
- JATAS
- Adv Expendables

Joint Common Architecture

Phase 1 – Air Vehicle Demonstration
- Rucker/FVL Study
- Configuration Trades & Analysis
- PSR
- CSR
- 1st flight
- JMR Spec Dev

Joint Common Architecture Demonstration

Mission Systems Architecture Demonstration

Phase 2 Spec

MS ETA

SUMIT
- Adv Cockpit Concepts
- Cockpit Msn Commander

JMR Weapons Sys Integration

Weapons & Sensors
- AV Airburst Munitions
- Fire control w/ Windage compensation
- A/C deployed Weapons & sensors
- AFRL DE Concept

Cockpit (HMI, Decision Aiding, Teaming)
- NRTC TAJI
- SUMIT
- DELCON
- AUCUS
- ATUAS
- RPA
- UACO
- AMUST-D

Approved for public release; distribution unlimited.
1. The Boeing Company
   - Mission scenarios/interoperability based communication analysis

2. Honeywell Aerospace
   - Sensor and sensor fusion trade study

3. Lockheed Martin Corp.
   - Cockpit HMI technology trade study
   - Capability based Mission Equipment Package (MEP) trade study
   - Weapons vs. targets vs. missions trade study
   - Trade study to optimize battlefield sensing

4. Rockwell Collins, Inc.
   - Mission systems architectural trade study

5. Sikorsky Aircraft Corp.
   - Survivability optimization analysis

6. SURVICE Engineering Co.
   - Lethality Systems Load Out Trades and Analysis Tool
   - Survivability Systems Load Out Trades and Analysis Tool

Purpose of the MS ETA efforts are to define the trade space to support development of the Phase 2 specification
The Government is no longer considering demonstrating Phase 2 advanced mission systems components on the Phase 1 air vehicles

- The Government does not intend to keep the Phase 1 air vehicles as residual test assets for follow-on work
- Designing the Phase 1 air vehicles, to include provisioning for advanced mission systems components and flight time for additional testing, would increase cost substantially
- Phase 2 reliance on Phase 1 test beds would drive the Phase 2 risk up significantly
- Phase 2 is not currently resourced for flight testing

Both phases will inform Government analyses and development of the JMR Model Performance Specification (MPS)

Phase 1 and Phase 2 demonstrations are separate events which will comprise discrete agreements, design, development and test activities
• Phase 1 is focused towards the development of a Utility vehicle
• Phase 2 addresses the Attack mission as the most stressing for mission systems development
• Model Performance Specification (MPS)
  – Describes the capabilities and performance of an S&T objective aircraft
  – Is based on current priorities and expectations
  – Will continue to evolve
• Critical considerations
  – Scaling
  – Commonality
  – Survivability
• Relationship with Future Vertical Lift (FVL) Program of Record (PoR)
• Phase 1 Business Approach
  – Schedule
  – Data Rights
  – Feedback