Presented at the:

JMR TD Pre-Solicitation Conference
Williamsburg, Virginia

US ARMY RDECOM

Joint Multi-Role Technology Demonstrator (JMR TD)

AMRDEC

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

1 November 2012

Presented by:

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JMR JOINT MULTI-ROLE TECH DEMO

Guidelines for this Meeting

- 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

Welcome

- 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

JMR TD Fact Sheet

- 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 <u>not</u>
  - An FVL prototyping effort
  - Indicative of an end state FVL performance requirement

JMR TD Schedule Overview

FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20

Rucker/FVL Study

Ph I | **Ph II**

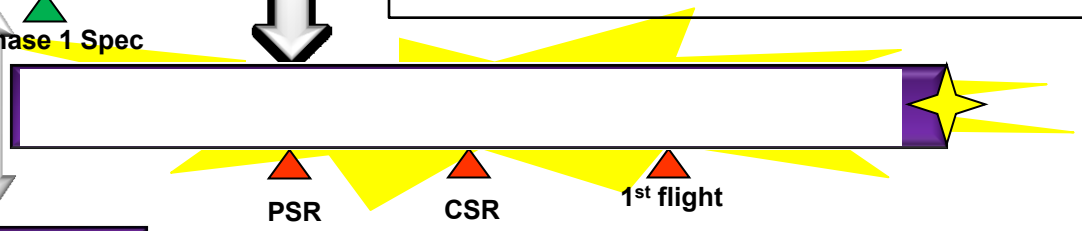
Vehicle Trades

Scope:
- Trade space description
- Prioritize critical attributes/capabilities
- Establish success metrics
- Assess value and affordability

Phase 1 Spec

MS 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

JCA Demo

Phase 2 Spec

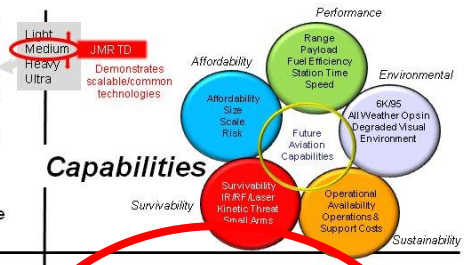
Scope:
- Instantiate MS architectures based on a unified modeling approach to avionics system development
- Integrate and evaluate advanced crew station technologies a relevant environ.
- Explore OPV implications

Phase 2 – Mission Systems

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 Commonality

Capability to Perform Worldwide Operations

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JMR Design Space Excursion Matrix

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Updated JMR Excursion Matrix – 8 September 2011

	Attribute	1a) Mid-Capability	2a) 4K/95	3a) Small	4a) Large	5a) Flat-Rated	6a) Small Deck Ship	7) Dedicated Attack/ Recon	8) Defined by Contractor
Primary Design Profile	Takeoff Condition	6K/95F 95% MURP VROC fallout	4K/95F 95% MURP VROC fallout	6K/95 95% MURP VROC fallout	6K/95F 95% MURP VROC fallout	6K/95F 95% MURP VROC fallout	SL/103F 95% MURP VROC fallout	6K/95F 95% MURP VROC fallout	Atmosphere: CFI VROC CFI
	Mission Radius	424 km	424 km	424 km	424 km	424 km	424 km	424 km	424 km
	Midpoint Condition	6K/95F VROC fallout	4K/95F VROC fallout	6K/95F VROC fallout	6K/95F VROC fallout	6K/95F VROC fallout	6K/95F VROC fallout	6K/95F VROC fallout	6K/95F VROC CFI
	Midpoint Loiter	30min	30min	30min	30min	30min	30min	120min	30min
	Payload	6,600 lb internal	6,600 lb internal	4,015 lb internal (Limited to AATE class engine)	10,000 lb internal	6,600 lb internal	Fallout lb internal	1,850lb payload, 21 ft² stores drag	External: CFI lb Internal: CFI lb
	MEP Weight	1,000 lb	1,000 lb	1,000 lb	1,000 lb	1,000 lb	1,000 lb	3,650 lb	CFI
	Troop Capacity	18	18	11	24	18	≥6	n/a	CFI
	Transmission Sizing Atmosphere	SL/103F	SL/103F	SL/103F	SL/103F	6K/95F	SL/103F	SL/103F	CFI
	Shipboard	LHD	LHD	LHD	LHD (V-22 limit)	LHD	DDG	LHD	DDG – LHD
Fuel Tank Sizing Profile	Fuel Tank Sizing: Attack/Recon Mission	Size integral fuel: 1,000 lb+ 2,650 lb MEP, 1,850 lb payload 120min loiter, 21 ft² stores drag	Size integral fuel: 1,000 lb+ 2,650 lb MEP, 1,850 lb payload 1: 2: d	Size integral fuel: 1,000 lb+ 2,650 lb MEP, 1,650 lb payload	Size integral fuel: 1,000 lb+ 2,650 lb MEP, 1,850 lb payload 120min loiter, 21 ft² stores drag	Size integral fuel: 1,000 lb+ 2,650 lb MEP, 1,850 lb payload 120min loiter, 21 ft² stores drag	Fallout radius, SL/103F TO, TOS ≥ 30min: 1,000 lb + 800lb MEP 400 lb payload 9 ft² stores drag	Design Mission	MEP: CFI Payload: CFI lb 120min loiter Stores drag: CFI

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Conduct Sensitivity Studies and Vehicle Trades

Model Performanc Spec

1st Iteration of Vehicle Specification

Unprioritized Attributes

Identify Technology Enablers for Vehicle Demonstration

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Industry CT&A Efforts

Tasks

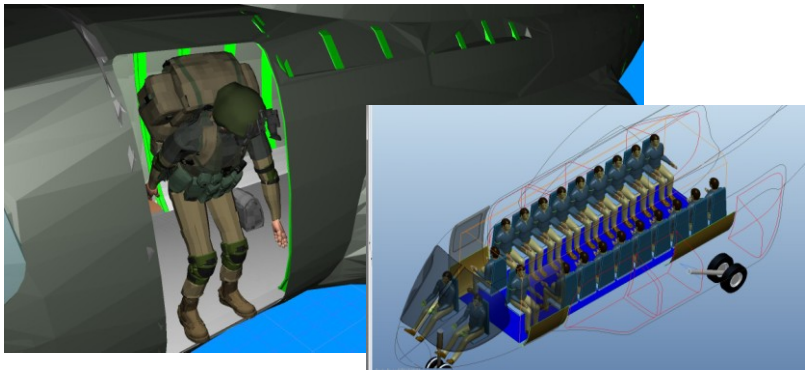
- ✓ Technology trade study and maturation plan.
- ✓ Sensitivity analysis that quantifies effects of capability on cost and size and effects of sizing on cost, weight and performance
- ✓ Assessment of mission equipment packages (MEP) and survivability effects on cost, weight and performance
- ✓ Design 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

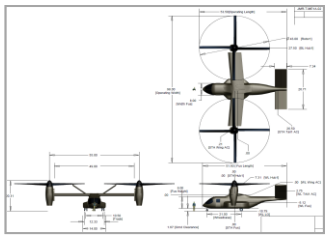
Government CT&A Efforts

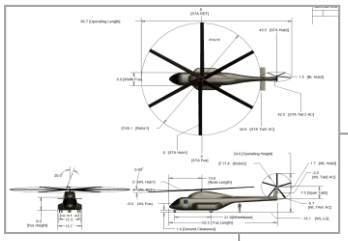
Dismounted Soldier Egress

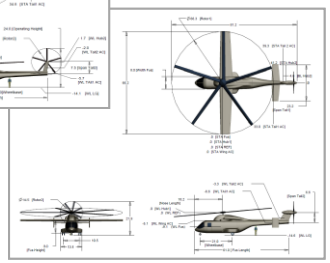


Armor layout

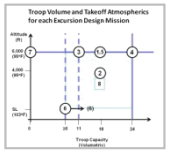
Dismounted Soldier Seated Space Volume



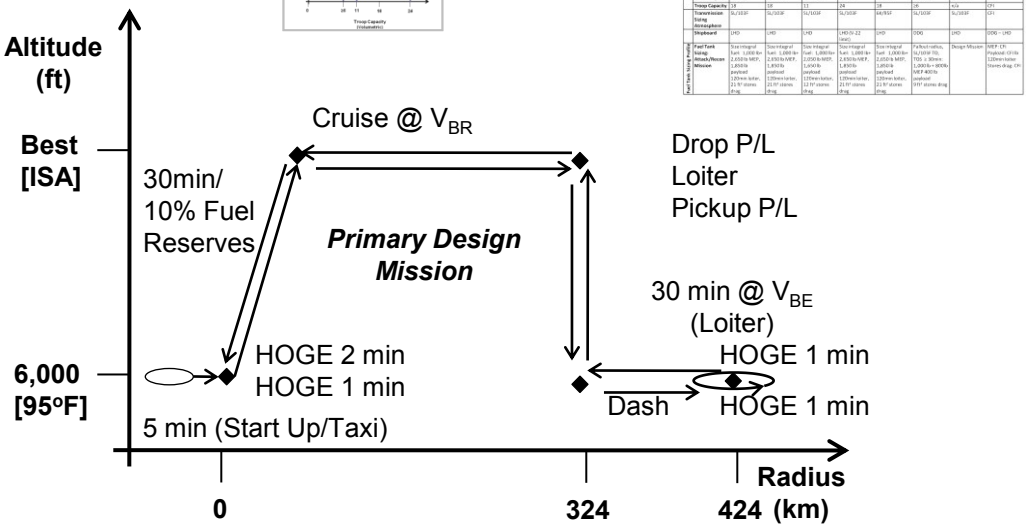




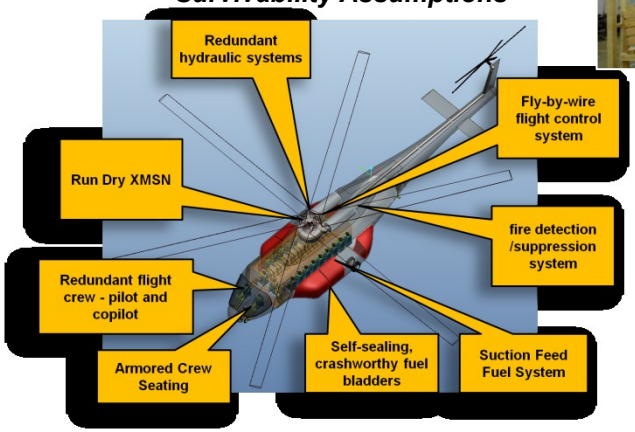
- *Advanced Helicopter*
- *Big-Wing Compound*
- *Advanced Tilt Rotor*



Excursion Matrix and trade space



Survivability Assumptions



Concept Design for Dismounted Troop Accommodation

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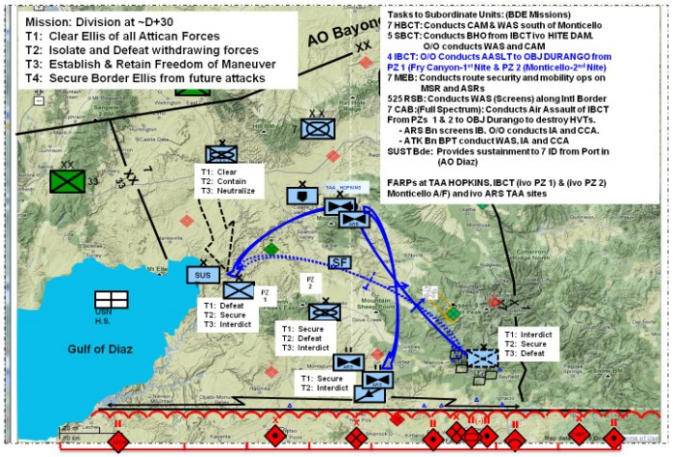
JMR TD Operations Analysis

- 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



Phase 1 Air Vehicle Demonstration

- 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
    - Demonstrate technologies that do not require flight test for demonstration
    - 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

Phase 2 Mission Systems Demonstration

- 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
  - Collaborate with Government and Industry experts in the areas of:
    - Mission Systems architecture affordability and resiliency
    - Mission Systems effectiveness optimization
    - Optionally Piloted Vehicle (OPV)
  - 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

JMR Technology Demonstrator

FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20

Rucker/FVL Study

Configuration Trades& Analysis

Phase 1 – Air Vehicle Demonstration

PSR | CSR | 1st flight

JMR Spec Dev

Joint Common Architecture

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

GOV In-House Effort

Contractual Effort

Phase 2 – Mission Systems Demonstration

JCA Demonstration

Mission Systems Architecture Demonstration

Phase 2 Spec

MS ETA

SUMIT — Adv Cockpit Concepts

SUMIT — Cockpit Msn Commander

JMR Weapons Sys Integration

AMRDEC Tech Feeders

Plus other RDECs and DOD

Architecture
- SNAP
- FACE
- JFOWG
- MCAP

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

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
- AACUS
- ATUAS
- RPA
- UACO
- AMUST-D

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Mission Systems Effectiveness Trades and Analysis

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

Relationship Between Phase 1 and Phase 2 efforts

- 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

Key Tenants of the JMR TD

- 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