## The S&T Challenge
### Future Aviation Decision Points

<table>
<thead>
<tr>
<th>MISSION</th>
<th>SERVICE</th>
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<tbody>
<tr>
<td>Attack</td>
<td>ARMY</td>
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<tr>
<td>Armed</td>
<td>USMC</td>
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<tr>
<td>Recon</td>
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<td>Scout</td>
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<td>ISR</td>
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<tr>
<td>Utility</td>
<td>UH-1Y</td>
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<tr>
<td>Medevac</td>
<td>VH-3/60</td>
</tr>
<tr>
<td>SOF</td>
<td>MV-22B</td>
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<tr>
<td>ASW</td>
<td>CH-53D</td>
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<tr>
<td>SUW</td>
<td>UH-72A</td>
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<tr>
<td>Transport</td>
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<td>Assault</td>
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<td>VertRep</td>
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<tr>
<td>SAR</td>
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<tr>
<td>Mine CM</td>
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<tr>
<td>CSAR</td>
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<tr>
<td>Heavy Lift</td>
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<tr>
<td>Mine CM</td>
<td>ARMY</td>
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<tr>
<td>SOF</td>
<td>USN</td>
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<tr>
<td>Ultralight Lift</td>
<td>USMC</td>
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<td></td>
<td>USAF</td>
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- **2009**: Tied to Army OH-58D replacement
- **2015**: Pending decision on armed recon analysis
- **2020**: ICD in work
- **2025**: Estimated Half-life
- **2030**: Estimated End of Useful Life
- **2035**: Initial Operational Capability

**Note**: DP 1: SLEP or New Start Technology Development
**Note**: DP 2: New Start EMD
Future Roadmap

**2025 Timeframe**
- AH64/KW replacement
  - Smaller, lighter, more affordable
  - Integrated approach to survivability
  - Optionally manned
- Manned-Unmanned complementary MEP and weapons
- UAS autonomy/FBCT objective UAS systems

**2030 Timeframe**
- UH-60 Replacement
  - 6K/95° flight performance
  - Extend Life of UH-60M
- Replace LUH with COTS

**2035 Timeframe**
- CH-47 Replacement
  - Common MEP/ components
  - 6K/95° flight performance
  - Leverage JHL tech demo
JOINT MULTI-ROLE TECHNOLOGY DEMONSTRATOR

Objectives:
- Support the Army (& Joint Services) develop requirements for FVL
- Focus on FVL-M Utility configuration

FVL-M Goals:
- Shipboard compatible
- Transport 12 combat equipped troops
- Maximum Cruise Speed – 230 kts (minimum) (UH-60/AH-64 ~145 kts)
- Combat Radius – 424 km (UH-60/AH-64 ~200 km)
- Operating Environment – 6K/95°
- Hover Efficiency, cruise efficiency, weight efficiency – similar to the existing fleet

265 mph
263 miles
SIDE BY SIDE TROOP COMPARISON

95th Percentile Male (290 lbs)

2015 Land Warrior (335 lbs)

60.5”

54”

21.5”

23”

29.5”

31.5”

35”

38”
IGOR SIKORSKY & FRANK PIASECKI

Sikorsky VS-300
First successful free flight of a helicopter
May 13, 1940

Piasecki PV-2
1943
THE NEED FOR SPEED . . . .

Bell XV-3 1955

Lockheed AH-56 1967

Sikorsky HX-59 1973

Vertol VZ-2 1958

Bell XV-15 1977
RECENT ADVANCEMENTS

Sikorsky X2
250 knots - 2010

Eurocopter X-3
255 knots - 2013
**Phase 1 – Air Vehicle Development**

- **MS Trades**
  - Trades and Analyses
    - Architectures
    - Communications
    - Sensors and Sensor Fusion
    - Cockpit HMI Technologies
    - Survivability
  - BAA Award
  - PSR
  - CSR
  - 1st flight

- **Joint Common Architecture**
  - Conceptual Design of Full Architectures
  - Development / Integration of Key Architectural Components
  - Demonstrated Benefits of Model Based Approach & Open Systems Architecture

- **Phase 2 – Mission Systems Demo**
  - BAA Award
  - PSR
  - CSR

**Rucker/FVL Study**

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

- **Vehicle Trades**
  - Ph II
  - Trade space description
  - Prioritize critical attributes/capabilities
  - Establish success metrics
  - Assess value and affordability

**JCA Demo**

- Release JCA V1.0

- **FY09 FY10 FY11**
- **FY12 FY13 FY14**
- **FY15 FY16 FY17**
- **FY18 FY19 FY20**
THE CONTENDERS

Bell Helicopter

AVX Aircraft

Karem Aircraft

Sikorsky-Boeing
KEY CONFIGURATION FEATURE

- Lift Offset Coax Configuration
- Pusher Prop
- Variable RPM drive system to manage main rotor blade tip speed to enable high speed cruise
SIKORSKY / BOEING SB>1 DEFIANT

Joint Multi-Role Technology Demonstrator

- **X2™ Technology**
- Advanced Drive System
- Advanced Rigid Rotor System
- Lift Offset Co-Axial Rotor
- Retractable Gear
- Crew of four
- Pusher Prop
- Cabin for 12 Combat equipped troops
JMR TO FVL PROGRAM PLAN

Joint Multi-Role Technology Demonstrator

S-97 RAIDER™

X2 Technology™ Demonstrator

JMR TD

FVL

JMR TD CO-LOCATION

• Sikorsky and Boeing teams co-located
  - Approximately 120 people
  - Co-mingled teams (by IPT)

• Common IT Infrastructure
  – Team Center Community
  – CATIA v5
  – Enovia Product Data Manager

• Motion Based Simulators
  – Design maturation
  – Customer feedback

• Full Scale Mock-ups
### PROGRAM KPPs

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>Units</th>
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<tbody>
<tr>
<td>Performance</td>
<td>$V_{MCP100%}$ Speed</td>
<td>KTAS</td>
</tr>
<tr>
<td>Hover Efficiency</td>
<td>Power Loading</td>
<td>lb/shp</td>
</tr>
<tr>
<td>Cruise Efficiency</td>
<td>Aircraft L/De</td>
<td>--</td>
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<tr>
<td>Weight Efficiency</td>
<td>Weight Empty Fraction (3.0g)</td>
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REDUCE KEY RISKS THRU DEMONSTRATION

Joint Multi-Role Technology Demonstrator

Design

Wind Tunnel

System Integration

RAIDER™ Flight Test

Piloted Simulation Facility

Advanced Manufacturing
FLIGHT TESTING

Propulsion System Test Bed

Flight Demonstrator

PSTB  A/C Tie Down
UNCLASSIFIED
FY34 IOC Proposed Schedule
(Dual Vendor thru MS B, Single Vendor Beyond)

USG Funding:
- FY13: $1M
- FY14: $7M
- FY15: $20M
- FY16: $23M
- FY17: $20M
- FY18: $18M
- FY19: $10M

Potential market of ~3000 attack/utility helicopters

JMR TD PH1 supports RFP Development to win FVL-Medium
QUESTIONS?