NDIA TWV Conference

TWV Transformation Efforts

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6 February, 2007

Agenda

- Evolution of Light Tactical Vehicles
- Input to JLTV timeline
- Market Research (EMIP & PSD)
- Science & Technology programs
  - Army and ONR S&T
  - FTTS ACTD Overview
  - MSV and UV Vehicle Capabilities and Lessons Learned
  - ONR S&T Support to JLTV
  - CTV Technology Demonstrator
- Who's Who in JLTV Program Planning
- Current JLTV Acquisition Schedule
- Summary

Light Tactical Vehicle Evolution: Jeep to JLTV

1959-1984
M151

Technology Improvements:
Redesigned for the Military. Featuring a longer wheelbase, softer ride, more powerful engine, manual transmission, and four wheel independent suspension

1984-1995
M1025

Technology Improvements:
A0 Series (1984-93) 6.2L diesel engine, 3 spd transmission, 2,500 lb. payload (incl. crew), Up to 3,632 lb. Payload (shelter carrier)
86,237 produced
A1 Series (1991-95) Improved drivetrain, Improved suspension
8,899 produced
A2 Series (1994-present) 6.5L engine, 4 spd electronic trans, 9,000 lb. winch, CTIS ready, 4,400 lb. payload (incl. crew), 9,013 produced

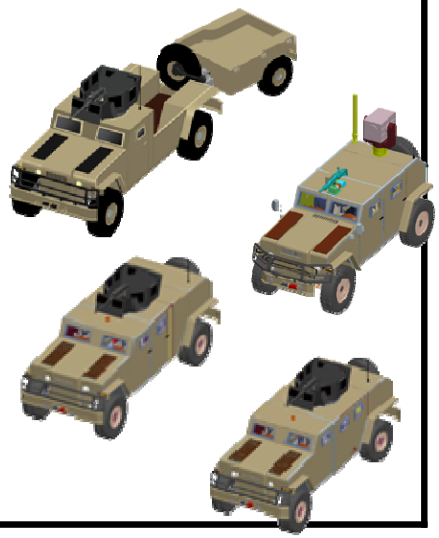
1993-?
M1114/M1151

Technology Improvements:
Expanded Capacity Vehicles (1993-present)
5,100 lb. payload (M1113, M1151/1152, incl. crew)
Heavy Up-Armored HMMWV (M1114 UAH)

(2005 Golden HMMWV)

2010-Future
JLTV FOV

Technology Improvements:
Integrated Survivability (Armor),
Integrated C4ISR (space, weight, power)
Net Payload Capacity with Armor
Improved Mobility with and without Armor



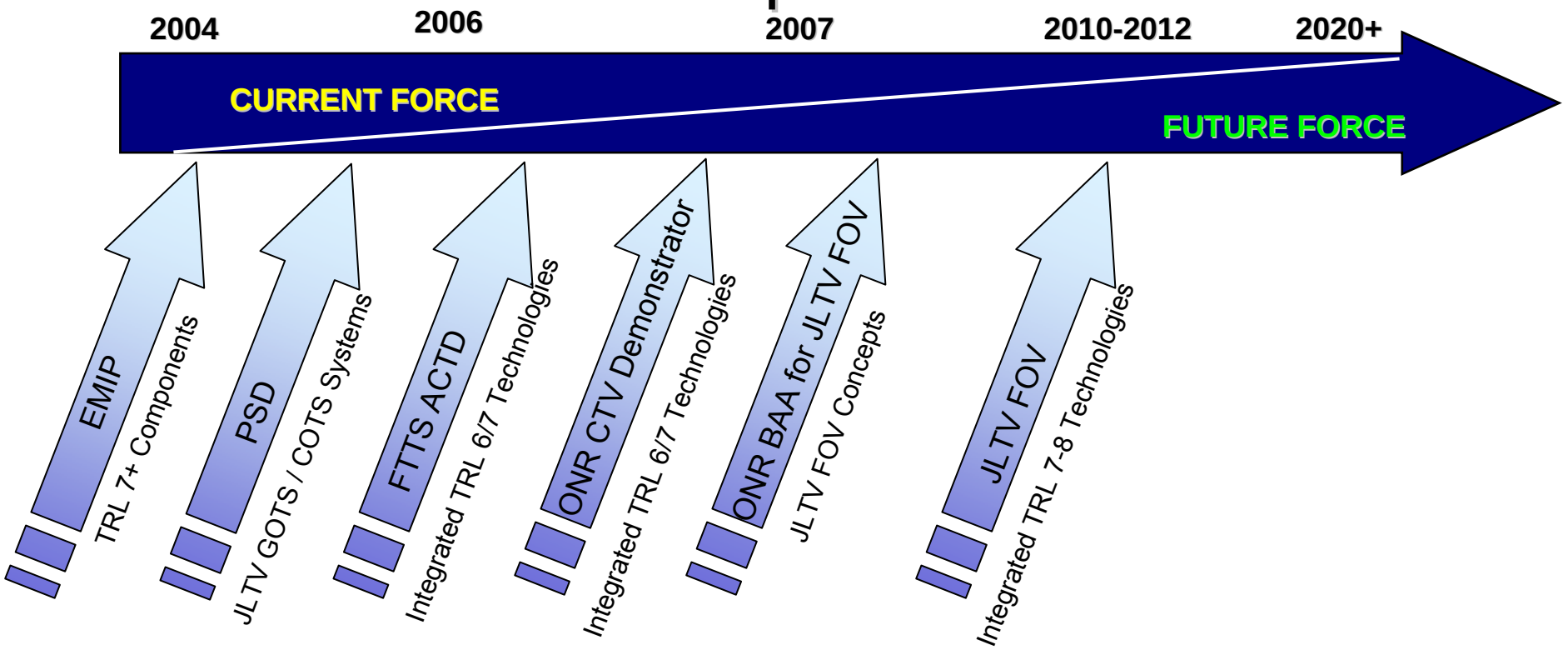
Today's Light Vehicle is More Complex – Modernization Cycles Accelerating

Differences between HMMWV & JLTV Programs

- Governance Army Only
- MDA is PEO CS&CSS
- Mandatory reports fewer
- Initiatives
  - Add on Armor
  - Safety

- Governance Joint Services
  - User Community
    - AMCB
    - TRADOC/MCCDC
    - GOSC
    - Joint Staff
  - DAB/OIPT Members
  - Secretary of the Army
  - Secretary of the Navy
  - HQMC/CG MCSC
- MDA is DAE
- Mandatory reports greater
- Initiatives
  - Concept Decision
  - Time Defined Acquisition
  - Fuel Reduction
  - Companion trailers designed to integrate with FOV

Joint Light Tactical Vehicle (JLTV) FOV Inputs



BLUF: ***Efforts will enable us to be smarter requirements and specification writers***

EMIP and PSD Demonstrations Open to Industry

Market Education – not Source Selection

- **EMIP** held demonstrations for 145 technology ideas during 2006
- YUMA, AZ Jan 06 and Three Quarterly Demos at Warren
- Process continuously demonstrates mature component technologies (lower risk)
- Useful to JLTV CDD and CPD as well as Current Fleet Technology Insertion
- Next EMIP Technology Application Idea deadline 16 Feb 07 for April Demos
  - EMIP web site: http://contracting.tacom.army.mil/ssn/sources.htm
- Technology Priorities
  - Improved Safety
  - Improved Survivability
  - Improved Reliability, Maintainability, and Supportability
  - Distribution and Mission Enhancements

EMIP
click blue box for collage

- **PSD** reviewed 32 systems during Aug 06 in Dec 07 reviewed the FTTS UVs and MSV with companion trailers
- Final report due Feb 07 to TWV BOD
- Demos invaluable in providing insights into potential performance which will support requirements development
  - Eg: GVW approaching 19,000 lb appears essential to meet LTAS protection and payload requirements
  - Eg:Power to weight ratio of 30HP/Ton appears essential to meet or exceed objective speed/acceleration requirement
  - Eg: GVW breakpoint for soft soil mobility appears to be in the 16,000-17,000 lbs range
  - Eg:Transportability by Helo and C-130 are further challenging constraints

PSD Overview
(click box for movie)

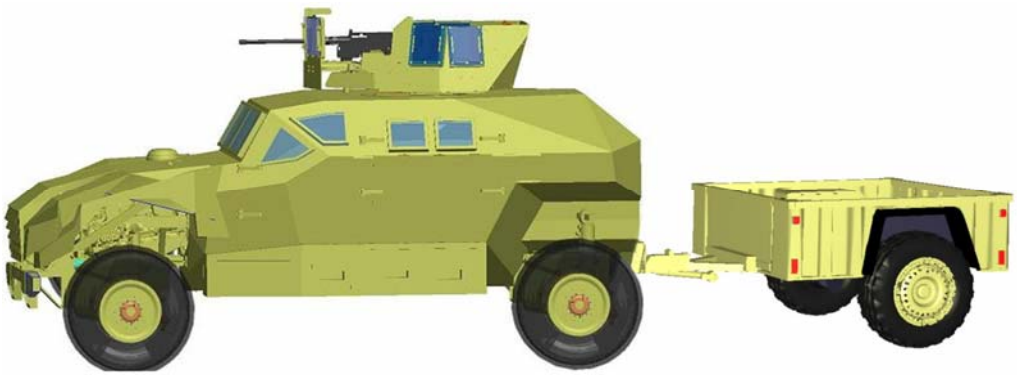
Army & ONR Science & Technology Programs Supporting JLTV

- **FTTS ACTD** funded two contractors to develop Utility Vehicle Demonstrators
  - Specifications based on FCS requirements
- Currently leveraging ACTD to support JLTV program
  - FTTS ACTD has and is transitioning information (Phase 1 M&S) to JLTV Requirements process and will continue with existing scope
  - FTTS ACTD Phase 2 will demonstrate JLTV Utility Vehicle "like" Mission Role Variant from two Tier 1 suppliers in an Operational Environment (Ft. Lewis)

[redacted]

FTTS VIP Demo
Click box for movie

- **ONR S&T** complements ACTD outputs by funding five additional vendors M&S to assess JLTV specific requirements contained in draft CDDs (30 Nov 06)
- ONR will demonstrate a JLTV Combat Tactical Vehicle Variant



Combined Army/USMC S&T will have provided 11 vendor's detailed M&S and 4 clean sheet of paper demonstrators prior to JLTV MS B - reducing program risk and helping shaping Future TWV requirements

FTTS ACTD

TARDEC

FY 05 | FY 06 | FY 07

OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP | OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP | OCT NOV DEC JAN FEB MAR APR

Phase I: Modeling & Simulation

Phase II: Demonstrator Build

Safety Testing

MUA

MSV Kr Award

UV Kr Award

MSV Build Award

UV Build Award

PSD

Demonstrator Delivery

Phase I: Modeling & Simulation

10 Months 5 Contractors

MSV

- Stewart & Stevenson (S&S) (Armor Holdings (AH))
- OshKosh Trucks (OTC)

UV

- International Military Group (IMG)
- Lockheed Martin (LM)
- Stewart & Stevenson (S&S)
- AM General (AMG)

Phase II: Demonstrator Builds

15 Months 3 Contractors

MSV & Trailer	UV & Trailer	UV & Trailer
S&S (AH)	*IMG*	*LM*

Platform Systems Demonstration

3 Weeks

16 Contractors

Assesses potential utility of industries available and complete integrated vehicle solutions against TWV capability gaps

Safety Assessment

10 Weeks

3 Contractors

(S&S (AH), IMG & LM)

Excellence in Testing ATC Aberdeen Test Center

Military Utility Assessment

6 Weeks

3 Contractors

(S&S (AH), IMG & LM)

Logistics Demo during MUA FT. Lewis

GONG MU RO

Utility (UV) Vehicle & Trailer

Command and Control (C2)

SUPPORT STARTS HERE

CASCOM / MCCDC

Requirements Generation Process

Ground Mobility Vehicle (GMV)

Long Range Surveillance Vehicle (LRS)

PEO CS&CSS

PM FTS

PEO CS&CSS/ PM FTS/ MARCORPSYSCOM

JLTV FOV Acquisition Process

Armor Holdings (AH) – FTTS Demonstrator

Maneuver Sustainment Vehicle (MSV) & Companion Trailer (CT)

Survivability & Force Protection
- Monocoque cab
- Modular Armor Kit
- Front, rear and side cameras
- NBC system
- Collision avoidance
- 2 person cab

Network Centricity
- Integrated communications suite
- Integrated computer system

Sustainability
- 30 kW exportable AC power
- Enhanced On-board Diagnostics
- Lube for Life (bushings & bearings)

Transportability
- 96"w x 102"h x 406"l
- C-17 transportable
- 49,000 lbs. Curb Weight
- 75,000 lbs. Gross Vehicle Weight

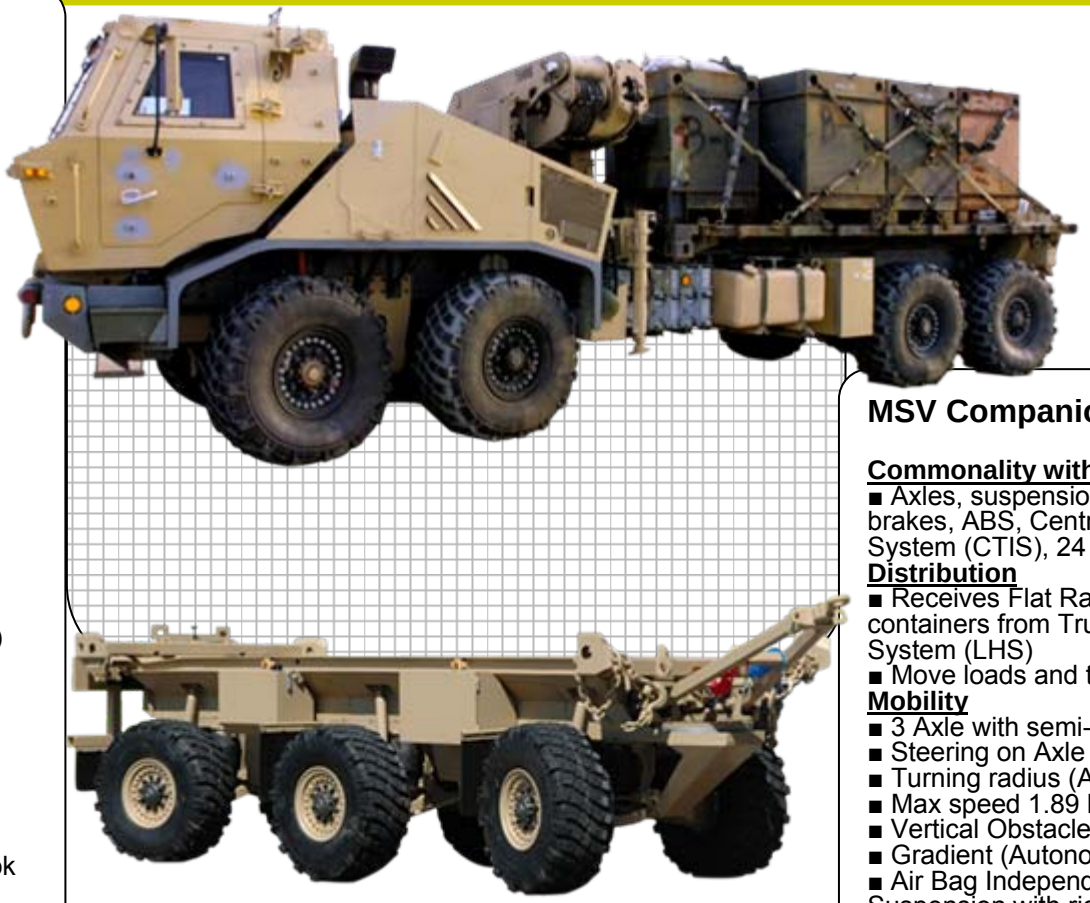
Mobility
- Parallel Hybrid Electric Propulsion
- Air Suspension Height Control (ASHC) and Load Monitoring System (LMS)
- Central Tire Inflation System (CTIS) / run-flat
- Anti-Lock Braking System (ABS)

Payload
- 13 Tons - Residual Payload w / B Kit

Distribution
- Multi-functional LHS & MHE crane hook lift and a forklift
- 6,100 lbs at 23 feet MHE
- 13,200 lbs at 24' 3" LHS

Operational Range
- 300 miles

- C9 8.4L engine (335 kW @ 2200 rpm)
- 4 NIMH batteries 8.5 amp hrs, 336 Volts
- Integrated starter/generator (ISG) 120kW peak, 100 kW continuous
- 7 speed hydrokinetic automatic transmission



MSV Companion Trailer (CT)

Commonality with MSV
- Axles, suspension, wheels, tires, brakes, ABS, Central Tire Inflation System (CTIS), 24 Volt CAN/Bus System

Distribution
- Receives Flat Racks and ISO containers from Truck Load Handling System (LHS)
- Move loads and trailer without truck

Mobility
- 3 Axle with semi-autonomous operation
- Steering on Axle #1 and #3
- Turning radius (Autonomous): 20 ft-8 in
- Max speed 1.89 MPH
- Vertical Obstacle 24 in Step
- Gradient (Autonomous) – 30%
- Air Bag Independent Wishbone Suspension with ride height control
- 230 mm Jounce, 200mm Rebound
- Central Tire Inflation System (CTIS)

Deployability
- Self-Powered offload C-130 and operational watercraft Joint Requirement

Operational Range
- Range 65 miles
- Power Diesel Engine (73 HP)
- Hydrostatic Drive Train
- Tethered Coupled / Wireless Uncoupled Control

International Military Group – FTTS Demonstrator

Utility Vehicle (UV) & Trailer

Survivability & Force Protection
- Monocoque cab
- Modular Armor Kit
- 2 person cab

Network Centricity
- Integrated communications suite
- Integrated computer system

Sustainability
- Limited on-board diagnostics
- 75kW integrated, exportable AC power

Transportability
- 92” w x 83” h x 221” l
- CH-47 and C-130 Transportable
- Demonstrator curbweight = 18,600 lbs
- Reducible weight = 16,400 lbs

Mobility
- Parallel Hybrid electric propulsion
- Torsion bar suspension, passive shocks
- Designed for adjustable ride height control
- Central Tire Inflation Systems (CTIS)
- Rear axle steer
- Anti-Lock Braking System (ABS)

Payload
- 3400 lb payload with integral armor
- On-board crane with 800 lb lift @ 8’

Operational Range
- Over 555 mile range

UV Companion Trailer

Commonality with UV
- Common tires, suspension, brakes with truck

Payload
- 5500 lb payload

Lockheed Martin – Owego – FTTS Demonstrator

Utility Vehicle (UV) & Trailer

Survivability & Force Protection
- Monocoque cab
- Modular Armor Kit
- Machine Gun Ringmount
- 2 crew + 1 jump seat

Network Centricity
- Integrated communications suite
- Integrated computer system

Sustainability
- Limited on-board diagnostics
- 8kW integrated exportable AC power

Transportability
- 95” w x 90” h x 229” l
- CH-47 & C-130 Transportable
- Demonstrator curbweight = 21,600 lb
- Reducible curbweight = 19,705 lb

Mobility
- Parallel Hybrid electric propulsion
- SLA suspension with Air Spring, passive shocks
- Adjustable Ride height control (4 position)
- Central Tire Inflation (CTIS)
- Anti-Lock Braking System (ABS)

Payload
- 3300 lb payload with A-kit armor
- On-board crane with 1000 lb lift @ 5’

Operational Range
- 528 mile range

UV Companion Trailer

Commonality with UV
- Common tires, suspension, brakes with truck

Payload
- 6100 lb payload

Lessons Learned from the ACTD

- That industry presently has products which potentially can meet *many* of our present and future requirements….. ***but not all, trades will be required***
- Integration of advanced technologies on *new* systems is possible…. ***but seldom without a significant effort and risk***
- Must be realistic in our requirements….. ***understand there is going to be limited dollars available***

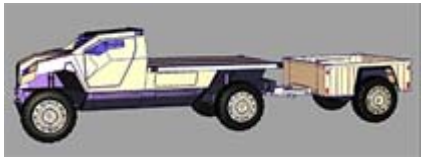
ONR S&T Support to JLTV

ONR is conducting studies, analyses and technology development efforts in the areas of concepts, survivability, and mobility

- **Technology evaluations and trade studies**
  - Awarded Contract to Nevada Automotive Test Center (NATC)
  - Validation of JLTV CDD and performance specification

- **Fabricate a Gap 1 technology demonstrator**
  - Nevada Automotive Test Center
  - Build, test, and evaluate a Combat Tactical Vehicle demonstrator platform



- **Concept studies/mockup construction**
  - Awarded contracts to AM General, General Dynamics, BAE, Cadillac Gage, Oshkosh
  - Generate concepts for FOV:
    - Near term concept (for MS B)
    - Far term concept (MS C and beyond)
    - Future technology investment areas
  - Deliverables aligned with key acquisition events

ONR (NATC) – Technology Demonstrator
Combat Tactical Vehicle *(CTV)*

Survivability & Force Protection
- 6 Marine/Soldier cab
- Monocoque Aluminum-based V-Shaped Lower Hull with Integrated Armor/Structure
- Modular Armor Kit
- Blast-Mitigating Seats
- Air Conditioning w/ Modular NBC
- Automatic Fire Suppression
- Accepts Multiple Weapons Stations

Network Centricity
- Integrated communications suite

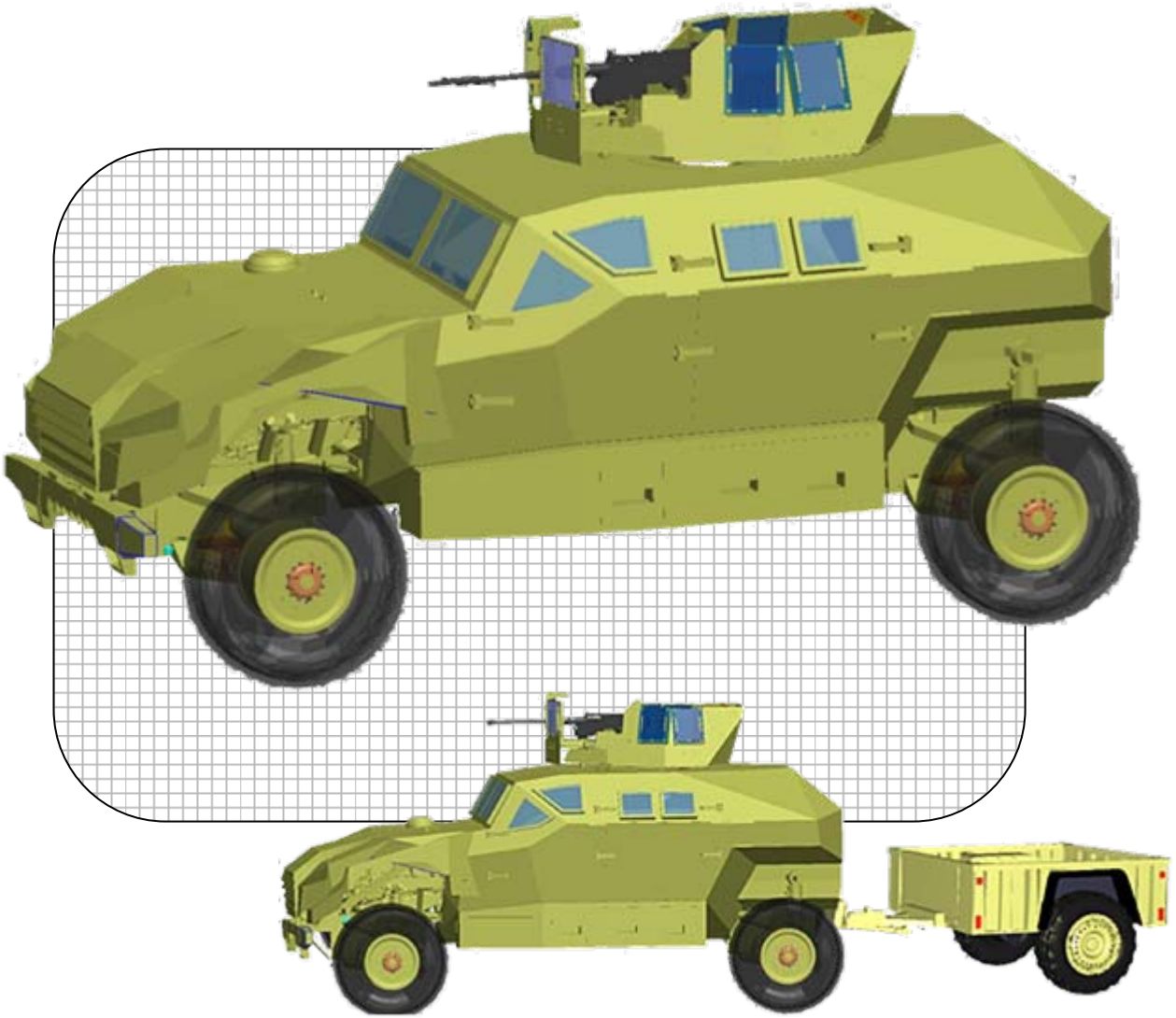
Sustainability
- Limited on-board diagnostics
- 10Kw on the Move & 30Kw Stationary Integrated, exportable AC power

Transportability
- 96" w x 220" l Operational Ht = ~ 86 inches & Reducible Ht = 76.4 inches
- CH53/CH47 EAT & C130 Transportable
- MPS & Amphibious shipping
- Demonstrator curb weight = 15,600 lbs

Mobility
- 322 Hp Detroit Diesel 926
- 6-Speed Twin Disc Transmission with Integral Transfer Case
- SLA Independent w/ 3-Position Ride Height Adjustment & 24" Wheel Travel
- Central Tire Inflation Systems (CTIS)
- Anti-Lock Braking System (ABS) w/ Integrated Stability Control

Payload
- 6000 lb payload with integral armor

Operational Range
- 400 miles



S&T Support to JLTV

ONR/RDECOM are conducting studies, analyses and technology development efforts in the areas of concepting, survivability, and mobility

Mobility Initiatives:

- Advanced suspension development
  - Awarded contract to L-3 Communications
- Mature Magneto-Rheological (M-R) fluid technology
- Transportability studies
  - Address critical ship and aircraft interface
- Fuel efficiency improvement initiatives
  - Define military duty cycles and conduct hybrid electric vehicle (HEV) studies
  - Conduct modeling and simulation to quantify vehicle energy usage
  - Pursue innovative powerplant and vehicle accessory energy reduction technologies

Survivability Initiatives:

- Requirements Analysis (Threats out to 2017), Technology Assessments (Industry & Govt.), Modeling & Simulation (Mine Protection, Operational Effectiveness), Technology Development/Maturation (Armor spin outs, non-Armor technologies)
- Integrated Survivability: Modular, Reconfigurable, System Engineering Design Approach

Who's Who in JLTV Program Planning

- Science and Technology
  TARDEC/ONR
  - Technology development for large database of information to support requirements development

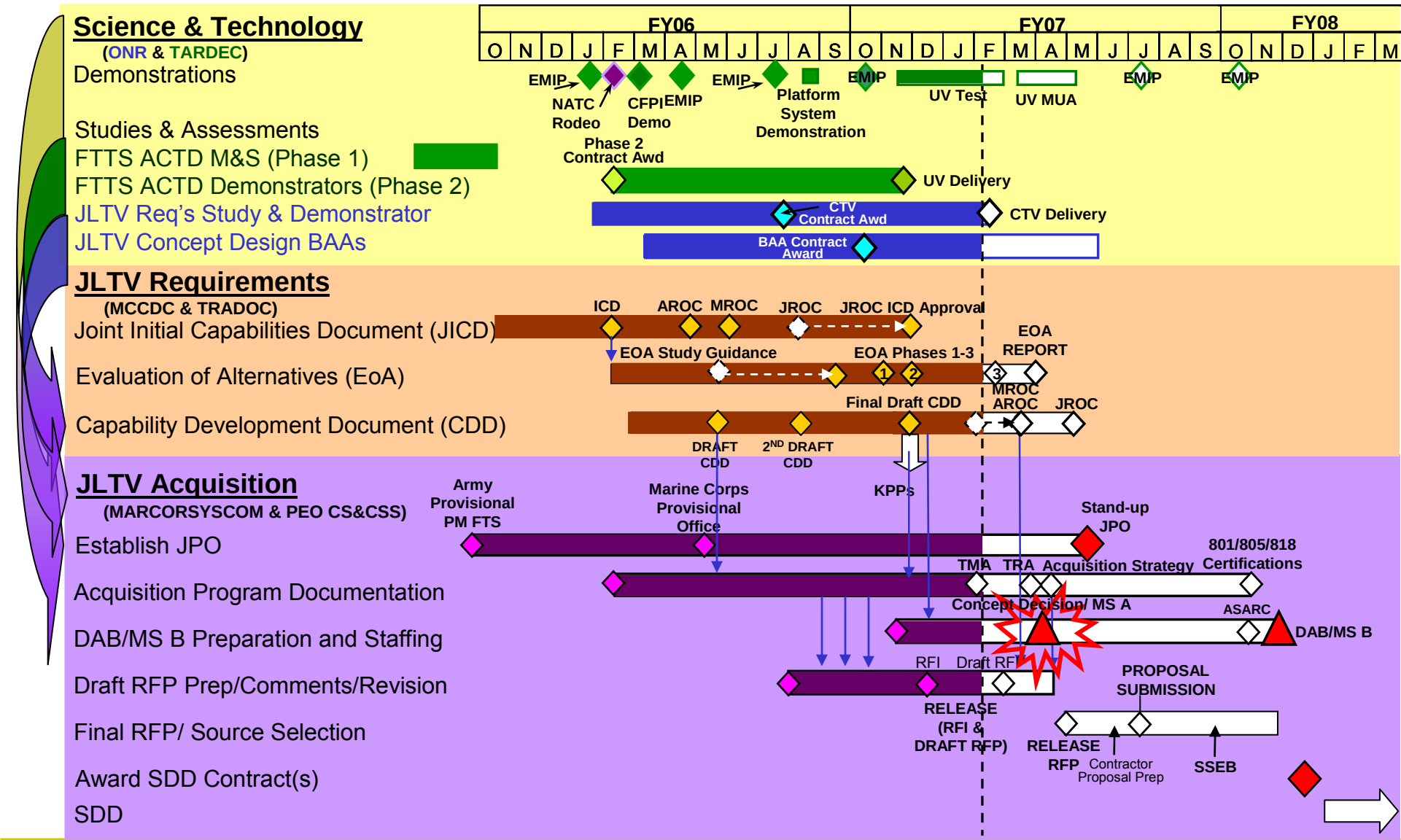
- Requirements Development
  CASCOM/ MCCDC
  - CDD development and staffing for approval

- Materiel Development
  PEO CS&CSS/MARCORSYSCOM
  - Milestone documentation development and approval for MS B

- Program Governance
  OSD/ARMY/NAVY
  - Program Certification and Milestone Decisions

JLTV Acquisition Schedule

As of 1 Feb 07 - NDIA



Summary

- Entering Program at the MS B NOV 07
- Draft RFP late Feb/early Mar 07; Final RFP May 07 – check FedBizOps
- JLTV is an opportunity for Industry… this is where you spend your IR&D
- RFP info will also be posted at the JLTV website http://contracting.tacom.army.mil/ssn/jltv.htm
- JLTV@tacom.army.mil