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Conducting a Competitive Prototype Acquisition Program: An Account of the Joint Light Tactical Vehicle (JLTV) Technology Development Phase.

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Conducting a Competitive Prototype Acquisition Program: An Account of the Joint Light Tactical Vehicle (JLTV) Technology Development Phase

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March 2013

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The Joint Light Tactical Vehicle (JLTV) was among the first defense programs to require a competitive prototyping acquisition strategy under the 19 Sep 07 USD (AT&L) policy Memorandum, "Prototyping and Competition." At Milestone A, the program was directed to inform the requirements process, validate technology maturity, assess commonality of components across a family of vehicles, and assess manufacturing risks. As a result, the joint program office simultaneously executed three weapon system prototyping contracts in a continuously competitive environment while meeting cost, schedule, and performance objectives. The goal of the JAP was to describe the program management strategy used in the JLTV Technology Development (TD) phase. The resulting document is a firsthand perspective from working within the Product Manager (PM). It discusses how TD acquisition phase program objectives were addressed and several unique management solutions. The focus is an account of planning and managing three contracts from Sep 2008 until May 2010. Information from the JLTV TD phase has significantly changed the requirements for the EMD phase. In addition to informing requirements, the program leveraged the competitive environment by maintaining constant emphasis on the contractors to meet cost and schedule. The results demonstrated that competitive prototyping can work.

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CONDUCTING A COMPETITIVE PROTOTYPE ACQUISITION PROGRAM: AN ACCOUNT OF THE JOINT LIGHT TACTICAL VEHICLE (JLTV) TECHNOLOGY DEVELOPMENT PHASE

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

The Joint Light Tactical Vehicle **(**JLTV) was among the first defense programs to require a competitive prototyping acquisition strategy under the 19 Sep 2007 USD (AT&L) policy Memorandum, "Prototyping and Competition." At Milestone A, the program was directed to inform the requirements process, validate technology maturity, assess commonality of components across a family of vehicles, and assess manufacturing risks. As a result, the joint program office simultaneously executed three weapon system prototyping contracts in a continuously competitive environment while meeting cost, schedule, and performance objectives. The goal of the JAP was to describe the program management strategy used in the JLTV Technology Development (TD) phase. The resulting document is a firsthand perspective from working within the Product Manager (PM). It discusses how TD acquisition phase program objectives were addressed and several unique management solutions. The focus is an account of planning and managing three contracts from Sep 2008 until May 2010. Information from the JLTV TD phase has significantly changed the requirements for the EMD phase. In addition to informing requirements, the program leveraged the competitive environment by maintaining constant emphasis on the contractors to meet cost and schedule. The results demonstrated that competitive prototyping can work.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAE	Army Acquisition Executive
ACAT I	Acquisition Category One
ACE	Advanced Collaboration Environment
ACTD	Advanced Concept Technology Demonstrations
ADM	Acquisition Decision Memorandum
C4I	Command, control, communications, computers and intelligence
C4ISR	Command, control, communications, computers, intelligence surveillance and reconnaissance
CDD	Capabilities Development Document
CDR	Critical Design Review
CDRL	Contract Data Requirements List
COR	Contracting Officer's Representative
COTS	Commercial Off-the-Shelf
CPD	Capability Production Document
CPP	Cooperative Program Personnel
CTVTD	Combat Tactical Vehicle Technology Demonstrator
DAU	Defense Acquisition University
DCMA	Defense Contract Management Agency
EoA	Evaluation of Alternatives
EVM	Earned Value Management
FAA	Functional Area Analysis
FNA	Functional Needs Analysis
FTTS	Future Tactical Truck System
GOTS	Government Off-the-Shelf
HMMWVs	High Mobility Multi-purpose Wheeled Vehicles
IBCT	Infantry Brigade Combat Team
IBR	Integrated Baseline Review
ICD	Initial Capabilities Document
IETM	Interactive Electronic Technical Manuals
IMP	Integrated Master Plan
IMS	Integrated Master Schedule
IPT	Integrated Product Team
JCIDS	Joint Capabilities Integration and Development System
JLTM	Joint Light Tactical Mobility
JLTV	Joint Light Tactical Vehicle
JPO	Joint Program Office
KP	Knowledge Points
KPP	Key Performance Parameter
KSA	Key System Attributes

LCMC	Life Cycle Management Command
LOI	Letter of Instruction
MCSC	Marine Corps System Command
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MEB	Marine Expeditionary Brigade
MRAP	Mine Resistant Ambush Protected
MS	Milestone
NDI	Non-Developmental Items
NPSW	New Program Startup Workshop
OEM	Original Equipment Manufacturer
OSD	Office of the Secretary of Defense
PA	Project Arrangement
PD	Purchase Description
PDR	Preliminary Design Review
PEO CS&CSS	Program Executive Office Combat Support & Combat Service Support
PM	Product Manager
PMJLTV	Product Manager Joint Light Tactical Vehicle
PMR	Program Management Review
RFP	Request For Proposal
RM	Risk Management
RMAP	Requirements Management and Analysis Plan
RMAS	Risk Management Assessment Structure
SANGB	Selfridge Air National Guard Base
SDD	System Design and Development
SE	Systems Engineering
SEP	Systems Engineering Plan
SOCOM	Special Operations Command
SOWM	Start of Work Meeting
SRR	System Requirements Review
SSA	Source Selection Authority
STRATCOM	Strategic Communications
TARDEC	Tank, Automotive, Research and Development Engineering Center
TD	Technology Development
TRL	Technology Readiness Level
TRR	Test Readiness Review
USD AT&L	Under Secretary of Defense for Acquisition, Technology, and Logistics
USMC	United States Marine Corps

I. INTRODUCTION

The Joint Light Tactical Vehicle (JLTV) addresses the need to bring more protection into tactical vehicles while continuing to meet payload and performance requirements. The JLTV Program Office mission statement emphasizes these points: "The JLTV is a joint service and international program which consists of a family of vehicles with companion trailers, capable of performing multiple mission roles that will be designed to provide protected, sustained, networked mobility for personnel and payloads across the full range of military operations (traditional to irregular)." The JLTV reinforces the service's approach to interoperable platforms that provide expeditionary and protected maneuver to forces currently supported by High Mobility Multi-purpose Wheeled Vehicles (HMMWVs). It is the central component of the U.S. Army's and USMC's Tactical Wheeled Vehicle Strategies.

In December 2007, the JLTV achieved a major step toward becoming a program of record with a Milestone A decision to enter the Technology Development (TD) phase of the DoD Acquisition System. The TD phase was needed to reduce technology risk, determine and mature the appropriate set of technologies to be integrated into a full system, and demonstrate the integration of critical technology elements on prototypes. TD would assess the viability of technologies while simultaneously refining user requirements. The decision required the Program Executive Office Combat Support & Combat Service Support (PEO CS&CSS) located with TACOM to award multiple contracts to acquire working JLTV prototype vehicles. The Project Manager Future Tactical Systems, which was provisional at the time, proceeded to prepare a Request for Proposal (RFP) and plan for a source selection.

This document is an account of how the JLTV Joint Product Office (JPO) planned, organized, and conducted the TD competitive prototype program. Background is provided and unique aspects of the program strategy are explained. The focus is an explanation of contract planning and managing three simultaneous contracts for the same item. It's a period in the program from about Sept. 2008 until May 2010 when vehicles were accepted and delivered. Events are described in chronological order. Program processes and initiatives are inserted at the point where those aspects emerged in significance.

II. PROGRAM ORIGINS

A. THE JLTV NEED IS IDENTIFIED

The 25-plus-year-old HMMWV fleet was rapidly approaching the end of its useful life. At the same time, the need for armor required capabilities far beyond its original purpose. In 2005, the Army and United States Marines Corps (USMC) conducted a Light Tactical Vehicle Functional Area Analysis (FAA) and Functional Needs Analysis (FNA) that identified capability gaps. The basic HMMWV platform was considered sub-optimized for future missions. New light-wheeled vehicle requirements were placing emphasis on force protection, survivability, payload, and transportability; command, control, communications, computers, intelligence surveillance, and reconnaissance (C4ISR); and reliability to effectively and efficiently defeat current and future threats. As a result of the analyses, it was determined that a new system was needed. It should share common components to the maximum practical level; possess inherent, modular, light-weight protection, and survivability suites; have mobility/automotive performance and fuel efficiency to complete the mission; support modular plug and play weapons/on board computer diagnostics/C4ISR packages tailored to individual missions and to maintain affordability; maintain useful payload when armored; and integrate survivability for combat operations. The vehicle meeting these needs would no longer simply be a tactical vehicle. The system should be designed to balance the "iron triangle" of payload, performance, and protection.

B. NEW START SOLUTION

Two main demonstration programs already were in process in 2005 to address the emerging need. These were the Army's Future Tactical Truck System (FTTS) Advanced Concept Technology Demonstration (ACTD) and the Marine Corps Combat Tactical Vehicle Technology Demonstrator (CTVTD). The lessons learned from these projects and a Joint Light Tactical Mobility (JLTM) Evaluation of Alternatives (EoA) were used to mitigate risks associated with the JLTV. The EoA (Joint Light Tactical Mobility Evaluation of Alternatives Final Report, 2007) evaluated four (4) alternatives: (1) base

case HMMWV; (2) product improved HMMWV; (3) Government Off-the-Shelf (GOTS)/Commercial Off-the-Shelf (COTS) platforms; and (4) a new-start vehicle design. Results of a JLTV Joint Functional Solutions Analysis, EoA, and Market Research revealed that alternative (4), a new start, was the most suitable solution to achieve Joint Capabilities Integration and Development System (JCIDS) developed requirements. The JCIDS would guide the service needs by ensuring combatant commanders are represented and requirements are accurately described in an Initial Capabilities Document (ICD) and future Capabilities Development Document (CDD). In addition, those early ACTD and CTVTD projects planted seeds in industry that encouraged independent research and development and continue to benefit program development in areas such as improvised explosive device protection and adjustable height suspension.

C. ACQUISITION STRATEGY EVOLVES

The FY06 Defense Authorization Bill Section 114 directed a new contract for a new class of vehicle that should be executed as a joint-service program between the Army and USMC. The JLTM was one of four initiatives identified as pilots for the Concept Decision Process conducted by the Office of the Secretary of Defense (OSD) during the period 2006-07 for the purpose of improving Strategic and Tactical Acquisition Excellence. The Concept Decision Process considered the JLTM for review with the intent of balancing the trade space of affordable and feasible investments, starting programs right with improved up-front planning, awareness of risk and more responsive acquisition solutions. The JLTV emerged as a contender. The services involved at that time (Army, USMC, Special Operations Command [SOCOM], USAF, and Navy) began integrating science and technology initiatives to support JLTV. The program was not envisioned as a heel-to-toe acquisition approach. The newly forming Joint Program Office (JPO) sought requirements or technology development activities, initiatives and studies that could be conducted concurrently. Numerous simultaneous events were conducted in 2006. A joint Initial Capabilities Document (ICD) was approved (The Joint Staff, 2006) in November of that year.

D. MILESTONE A

Following preparation of a milestone decision package developed by the provisional program management office, the JLTV was presented to the Defense Acquisition Executive Milestone Decision Authority, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L), Honorable John Young, for a Milestone (MS) B in August 2007 to enter the acquisition cycle at the System Design and Development phase. The Milestone B was not approved. Instead Mr. Young (USD, 2007) directed revising the acquisition strategy to enter at the Milestone A, Technology Development (TD) phase. His concerns were firm requirements, technology maturity, and adequate funding. He directed competitive prototyping of the key vehicle categories, analysis of options to sustain competition, maximizing commonality, and demonstrating Technology Readiness Level (TRL) 6.

Shortly after the JLTV decision, USD (AT&L) released the Memorandum, Subject: Prototyping and Competition, (USD, 2007) directing that all acquisition strategies requiring USD (AT&L) approval include "competitive, technically mature prototyping through MS B. The JLTV concept was subject to the memorandum intent to discover issues before the costly System Design and Development (SDD) phase. The memorandum describes DOD expectations that competitive prototyping would develop individual and team system engineering skills. The policy, and ultimately the Milestone A Acquisition Decision Memorandum (ADM) (USD, 2007), required the JLTV program to award at least three contracts using full-and-open competition procedures. The ADM exit criteria required: 1) approval of Capabilities Development Document (CDD) or Capability Production Document (CPD) supported by analysis for the TD phase; 2) demonstration of Technology Readiness Level (TRL) 6 or more; 3) demonstrate protection, transportability, reliability, and producibility; 4) assess commonality across the family of vehicles; and 5) assess production technical risks. The exit criteria would drive contract requirements, an Integrated Master Plan (IMP), and test plan during a 27-month TD phase. Decision documents included the Acquisition Strategy and the Test and Evaluation Strategy. "The JLTV approach will enable the Services to gauge technical potential against JLTV key performance parameters, placing emphasis on

modeling and simulation, systems component testing, risk reduction, and increased readiness for the Engineering and Manufacturing Development (EMD) phase"[1] (LTC W. Petermann, PM JLTV). Accomplishing TD objectives would inform the requirements process and support a MS B decision.

E. A JOINT PROGRAM OFFICE FORMS

The Milestone A decision point validated establishment of the JLTV JPO with the Army as the service Lead Agency. (Note: JPO used throughout and can also include support organizations from the Army and USMC.) The JPO, to be led by a Product Manager (PM), was charged to develop an effective joint organizational strategy with supporting structure and to conduct detailed management and execution of the program. The JPO would include Program Executive Office Combat Support and Combat Service Support (PEO CS&CSS) personnel located at the U.S. Army TACOM, Warren, Michigan, and the Marine Corps System Command (MCSC) located at Quantico, Virginia. Geographic separation required establishing a virtual operating environment. The PM's authority included funds management, acquisition management, planning and execution of production, fielding, and sustainment. JPO staff personnel were assigned to Product and Functional Integrated Product Teams (IPTs). IPTs would include representation from all appropriate disciplines, including user and test communities, as well as the Defense Contract Management Agency (DCMA).

The PM recognized that a unification strategy was critical. And not just at the leadership level, but at the Functional IPTs as well. With one exception, each Functional IPT was led by a high-grade level manager from the Army. The Requirements IPT was led by a USMC Combat Development Command representative. Army leaders frequently delegated roles and tasks to their USMC service leader, e.g., briefing weekly PM meetings, briefing Program Management Reviews (PMRs), and chairing meetings. The Functional IPTs sought face-to-face opportunities to strengthen teams. They often alternated meeting sites to share the travel burdens. All Pentagon and congressional meetings would be joint. Press releases would be developed jointly. The partnership

[1] SDD became EMD with the release of DODI 5000.02 in Dec 2008 (Department of Defense, 2008).

experienced forming, storming, and norming stages. Each service had different metrics for success, such as whose funding obligations and disbursements would be satisfied first. The Army tended to be more risk averse. The USMC tended to be more willing to apply calculated risks.

The JPO established and maintained active associations with OSD, Army, and USMC staff representatives. Overarching IPT reviews were held after each design review. The approach would identify and actively engage the key stakeholders and keep them updated throughout the TD phase. They were invited and encouraged to attend all major contract and program events. The JLTV was expected to be a future Major Defense Acquisition Program Acquisition Category (ACAT I) that needed to continually grow the stakeholder community.

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III. JLTV REQUIREMENTS MANAGEMENT

A. JCIDS PROCESS

In support of the JLTV, an Initial Capabilities Document (ICD) developed by the Joint Service Combat Developer was approved in 2006. This was followed by initiation of the CDD development. The JLTV JPO collaboratively addressed Requirements Management for the TD Phase working with the Combat Developer. The objective was to keep requirements development consistent with acquisition development.

B. REQUIREMENTS ANALYSIS PROCESS

1. Requirements Management and Analysis Plan

A joint Requirements Management and Analysis Plan (RMAP) (Department of the Army and Department of the Navy, 2009) portrayed here describes the technical and management approach the Joint Army and Marine Corps JLTV team used in the requirements refinement process activities during TD to update the CDD, the JLTV Purchase Description (PD), and other critical requirements documents in preparation for MS B.

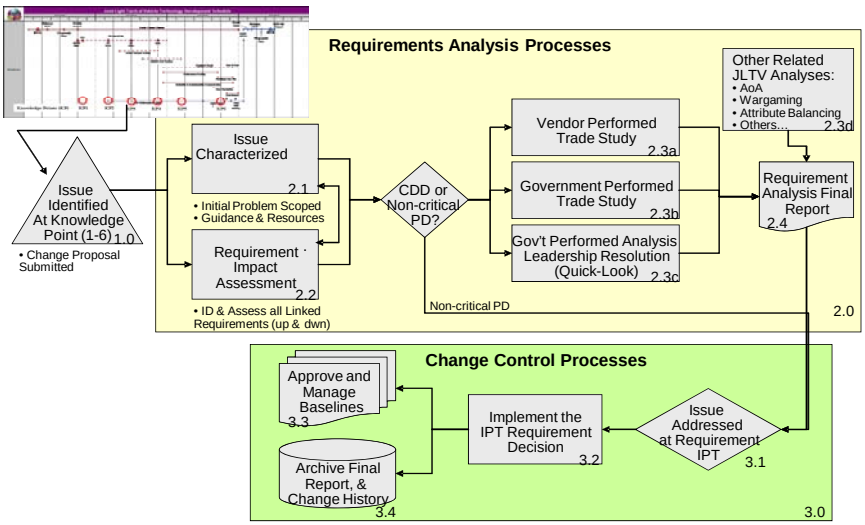

Figure 1. RMAP. From (Multiple 2008-9 PM JLTV Program Briefings)

Figure 1 depicts how the Requirement Analysis Process can result in a requirements change. The Requirements IPT determines how to manage the issue. This could range from a formal Trade Study if a KPP or KSA is impacted to a less rigorous quick-look. The IPT may also determine it is a non-issue or should be placed in TBD. The subject matter expert's judgment and data base software may be used to trace out what other requirements could be affected by the change. The RMAP would hear the voice of the user and give decision-makers timely requirements information. Required capabilities and performance characteristics were identified in a PD document that was written in performance terms to the greatest practical extent. RMAP attributes included expanded Materiel/Combat Developer collaboration; System Engineering (SE) approach to CDD Refinement; and knowledge-based and incremental shadow-CDD refinement. The SE approach to CDD refinement was accomplished with transparency and rigor through continual user representative involvement and formal cross-IPT events to synchronize or reconcile documentation. The Requirements IPT was supported by an

Issue Team that functioned as an information conduit and problem identifier. They relied on the SE and Test & Evaluation IPTs for interpretation, assessment, expert judgment, and data.

2. Knowledge Point Reviews

A key element of the RMAP was the use of CDD Knowledge Points (KP) that leveraged incremental TD Phase knowledge gained through contract execution and testing, interpreted implications on requirements, and minimized requirements risk. A total of seven government-only quarterly KP reviews were planned for the TD phase. KPs were informed by the analysis of efforts from all three JLTV prototype vehicle TD contractors. KP objectives were aligned with significant program events. The JPO sought the knowledge that would support KP agenda items through contractor responses to Integrated Master Plan (IMP) requirements, contract data deliverables, and Government testing. The KPs would reduce Engineering & Manufacturing Development (EMD) phase uncertainty and acquisition risk by tying program knowledge to the requirements documents.

Contributing to KPs was a primary responsibility of the Requirements Issues Team. The Requirements IPT was supported by an Issue Team that performed as an information conduit and problem identifier. They relied on SE and the Test & Evaluation IPTs for interpretation, assessment, expert judgment, and data. Issues Team members were the Requirements representatives on each contract IPT. KP reviews were used as a mechanism for confirming CDD requirements or indicating changes were needed to either CDD requirements or a Purchase Description (PD) content. Supporting data were gleaned from Vendor Compliance Matrixes delivered under the contracts, test results, TPMs (Technical Performance Measure), a holistic assessment of whole system trajectory toward meeting the requirements, or a failing in key areas. TPMs were defined in the System Engineering Plan (SEP) and reflected in the RMAP. Other analyses (internal or external) performed were indirectly related to vendor competitive prototype designs, (i.e., AoA results, Cost Data, etc). KPs would be followed by an SE IPT review to develop specifications or validate traceability to the PD.

3. Trade Studies

The Requirements IPT determined how to handle open actions per the RMAP. New requirements or those that may present a cost, schedule, or performance risk could require a Trade Study. These candidate requirements were channeled through a determination of whether a formal analysis was needed for a high impact change proposal, or if a high-level requirement was affected, such as a Key Performance Parameter (KPP) or Key System Attribute (KSA). A less rigorous analysis or quick-look fell under a TBR (To Be Resolved) for a lower impact change proposal or if a lower level requirement was affected. If an Issue was already known and already decided, then it was a non-Issue. Other Issues were placed into To Be Determined (TBD), CDD Unaffected, or Non-Critical PD Change. To resolve Other Issues, leadership provided guidance, problems were scoped, and resources were identified to support necessary action. CDD change proposals required supporting analyses as well as the recommended changes to language. An organization recommending changes needed to present such analysis at the IPT meetings. CDD changes would take effect in the JLTV EMD phase.

4. TD Phase JLTV Family of Vehicle Categories are Identified

The JLTV FoVs (throughout most of the TD phase) consisted of three Payload Categories—Category A (3,500 lbs. payload); Category B (4,000 lbs. for USMC & 4,500 lbs. payload for U.S. Army); and Category C (5,100 lbs. payload). Each category would be equipped with a companion trailer capable of carrying an equivalent payload. All configurations were designed to maximize commonality while meeting the specific needs of the user. Payload categories were further tailored with a set of mission-specific components (C4I, armor, weapons) to achieve requirements of all sub-configurations. The three Payload Categories represented FoVs for the Infantry Brigade Combat Team (IBCT) and other Brigade Combat Teams (BCTs), the USMC's Marine Expeditionary Brigade (MEB), and other services. The categories would bring back payload capacity that HMMWVs progressively lost as armor protection was added. Contracts were competitively awarded during the TD phase for original equipment manufacturers (OEMs) to supply prototype sample vehicles of each category along with companion trailers in a "system of systems" approach. The JLTV requires trailers which match the

vehicle's off-road performance capability, carry the same weight, and provide full interoperability. Developing a trailer in conjunction with the vehicle would assure compatibility that may be compromised with existing military trailers.

5. RMAP/CDD Process Analysis and Results

Establishing the Combat Developer-Materiel Developer Requirements IPT formalized a key working relationship. The IPT regularly reported to the PM. DA/USMC leadership recognized that the JPO supported the process. The RMAP/CDD process gave IPT members a broad opportunity to influence or contribute to CDD development. A pace of regularly scheduled meetings, KP reviews, and data sharing kept stakeholders informed. There were multiple ways to work through differences. The partnership broke some potential barriers between CD-MD, resulting in frequent open communication, and a collaborative dialogue. The process-oriented strategy may have reduced the number of unplanned meetings, increased agreements, and reduced issues. The CD entered higher level service/OSD reviews with one voice on most issues. The Issue Team provided a formalized process for resolving issues. A defined and organized process provided mechanisms to work problems and develop solutions. Both the CD and MD could request studies from each other. Issues could be spun off to the Risk Working Group. The product teams had a means to initiate action to resolve a problem or study a discovery that surfaced from the course of the contract activities or contact task execution.

Existence of a process kept CDD progress in motion. War fighter needs, whether stated or not, could be defined through synergy, investigation, observation, and creativity. It created tasks and milestones that could be measured. The Requirements Team could identify and record accomplishments. They were armed for informing leadership by presenting answers or recommendations. The Army/USMC could be in a position to support cost, schedule, and performance-informed trade-off discussions during CDD reviews.

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IV. TD PHASE BEGINS

A. JPO ORGANIZATION STRUCTURE DEVELOPS

The JPO organization strategy was to develop a structure that mirrored the program phase. The JPO was designed with three teams each dedicated to one of the three TD contracts.

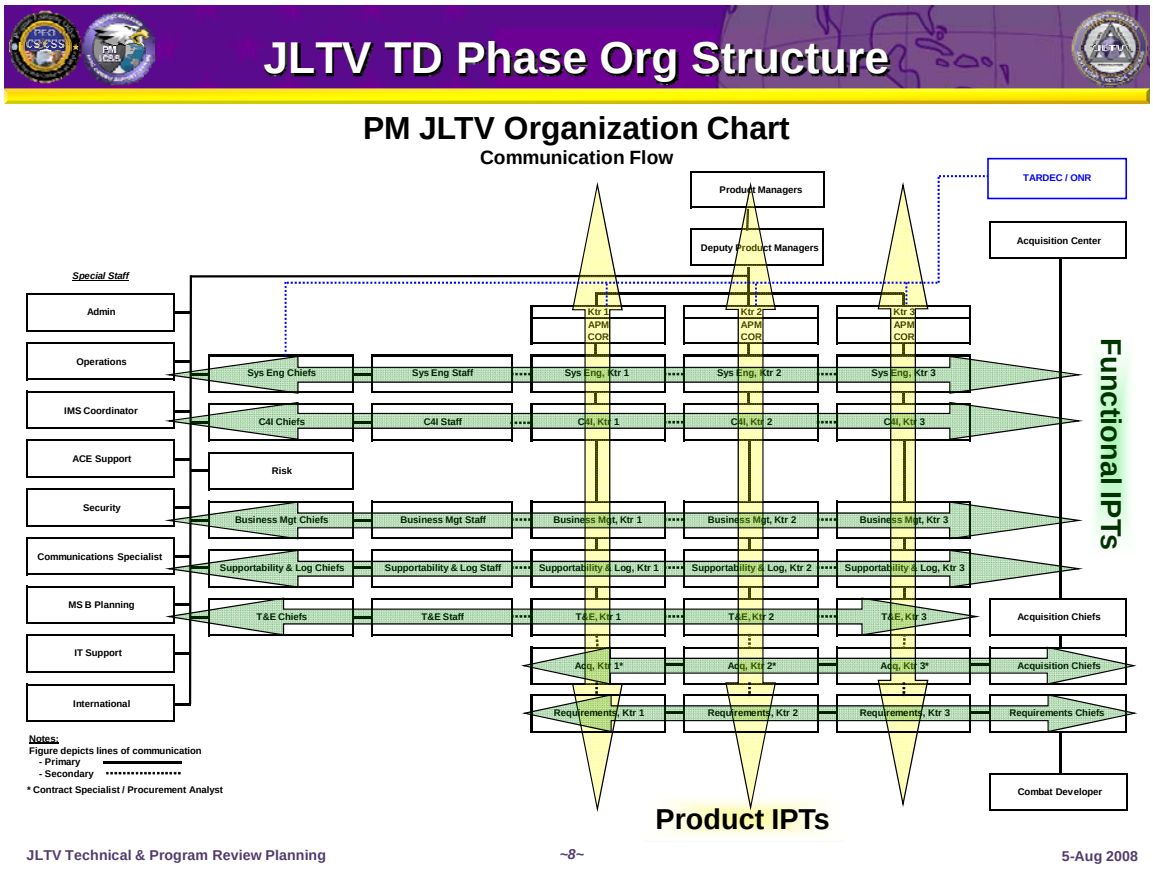

Figure 2. PM JLTV Organization Diagram. From Multiple 2008-9 PM JLTV Program Briefings.

1. Horizontal and Vertical Communication

Each contract team was led by an Assistant Project Manager (APM). These IPTs would also be known as product teams. The APMs reported to the PM. These "vertical" product teams were staffed with a Contracting Officer's Representative (COR), two

Systems Engineers, C4I Engineer, Product Quality Manager, Earned Value Manager, Procurement Analyst, Cost Analyst, Logistician, Program (budget) Analyst, Integrated Master Schedule Analyst, and a User representative all dedicated to one of the three contract efforts. Each functional specialist on this team was also a member of a supporting Functional IPT. The functional leads reported directly to the PM. They were not dedicated to a product team, but they provided horizontal support to all three contracts. The PM sought a structure supporting process consistency across the three JLTV TD contractors. The functional teams had support contractors and arrangements in place with other TACOM and MCSC organizations before contract start. It enabled the JPO to make efficient use of a relatively small staff. Approval of an organization staff Concept Plan opened the door for timely hiring. In addition to technical expertise, the functional leaders provided interpersonal skills and a steady influence on team tasks and challenging issues. The product and functional leaders provided the contractors with advice, interpreting performance requirements and specifications, and helped them to manage priorities. Throughout the TD phase, the model would promote sharing lessons learned up/down and left/right within the organization. The structure would empower managers, grow leaders, and mirror the program phase. The PM sought, and then later gained, approval to provide team leaders additional authorities. The structure would enable re-organizations that took place following vehicle deliveries and again at the end of the contracts as the JPO prepared for MS B and development of the EMD phase contract solicitation.

2. Program Office Tasks

TD phase goals, objectives, events, and tasks were identified and planned in anticipation that the JLTV would achieve Milestone B and become a Major Defense Acquisition Program (MDAP). While the program managed multiple contracts, the JPO would simultaneously conduct or participate in such activities as Program Status Reviews, OSD focus groups, General Officer Tactical Wheeled Vehicle Portfolio Reviews, Overarching IPTs, Working IPTs, Planning Programming and Budget Execution (PPBE) reviews, test planning meetings, C4I test meetings, PD reviews, EMD acquisition strategy development, and MS B documentation development.

B. STRATCOM

The PM's ability to communicate with JLTV customers, stakeholders, contractors, and JPO personnel would be critical to program success. A Strategic Communications (STRATCOM) and media relations plan were created to ensure the JPO executed and coordinated consistent public communications and media relations tactics, both internally and externally. JLTV STRATCOM was implemented through a media relations standard operating procedure. It would be the first program in PEO CS&CSS to have a dedicated communications strategy professional. It was considered critical for the U.S. Army and USMC program offices to execute coordinated and consistent communication. This approach would help control rumors and release timely and accurate public information. Press kits were developed and displays would be held at symposiums. Opportunities were planned for key events that included Start of Work Meeting (SOWM), Critical Design Review (CDR), and vehicle deliveries. Vehicles were displayed in the Pentagon courtyard shortly after the Government accepted delivery. VIPs were invited to ride and drive at the test center. A JLTV Branding and Style Guide was developed for use in all communication mediums. It provided guidance and standard formats for logo use, chart templates, color palette, fonts, and cover documents. Styles and guidelines were developed for conference and exhibit materials. JLTV TD contractors were asked to cooperate with the program objective to speak with one voice. The contract contained a clause that required contractors to obtain Contracting Office approval before releasing information to the public and comply with Army Regulation 360-1 The Army Public Affairs Program. Applying the JLTV STRATCOM helped insure that consistent and accurate information was presented throughout TD.

C. ACQUISITION STRATEGY AND REQUEST FOR PROPOSAL

Following MDA approval, the JPO followed Federal Acquisition Regulations Part 15 and completed a full-and-open competitive RFP release, industry Q&A period, Source Selection Board, and award of three Cost-type Research and Development contracts to large businesses. Each contractor would be required to submit Cost and Schedule

Control reports, perform Earned Value Management (EVM), and hold design reviews followed by the manufacture of seven JLTV prototype vehicles and four companion trailers. Industry could propose new start prototypes for each payload category or modified off-the-shelf vehicles. The latter was not expected for the vehicles due to continually emerging JLTV requirements and the amount and depth of design data that the contract required. Acquiring technical documentation was an additional primary objective of the contract. Data acquisition was essential to the program for numerous reasons, including managing risk, assessing technical readiness, verifying assumptions, and gauging industry capabilities all of which played a critical role in JLTV requirements validation and development. Each contract would require delivery of up to 58 different Contract Data Requirements List (CDRL) items. To accomplish these tasks the contractors would need to identify resources, organize sub-IPTs, develop a work breakdown structure, establish procedures, develop and present plans to the government, and identify areas not understood. The contractors would need to conduct a series of reviews and formal meetings. The vehicles were required to be delivered to both Aberdeen and Yuma Proving Grounds for a twelve-month government test. Initial delivery was due starting 15 months after contract award.

D. CONTRACT SOURCE SELECTION

Source selection was a best value approach based upon design maturity, program maturity, logistics commonality, past performance, and cost. The RFP explained that design maturity was the most important factor. The RFP also allowed the government to consider awarding based on technical diversity. Program maturity included the sub-elements resource loaded schedule, Capability Maturity Model Integration, and Systems Engineering. The RFP generated several competitive range proposals that met acquisition plan objectives, and offered reduced risk and diverse design solutions. A Source Selection Evaluation Board developed an assessment of each proposal for the Source Selection Authority (SSA). The selection process took approximately seven months. It included a delay while the Army and USMC sought additional Research and Development funding. The additional funding enabled meeting the goal of awarding

three contracts. The program was further set back when two of the unsuccessful bidders filed protests within one week of the contract award announcement. Contract activities were immediately suspended while the source selection board responded to the protest. The delay lasted 100 days, after which time the protests were denied.

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V. PRE-CONTRACT ACTIVITIES

While a program schedule setback, the protest period was utilized by the JPO to plan contract starts. The five strategies described in the following paragraphs either grew from existing processes tailored for the JLTV program or were completely unique.

A. DATA MANAGEMENT

1. Adapting Information Systems

The Tank Automotive Research, Development and Engineering Center's (TARDEC) Advanced Collaborative Environment (ACE) that existed before the TD Request for Proposal was released served as the foundation for JLTV unclassified data management. TARDEC personnel tailored an ACE interface to meet PM JLTV's needs. ACE contained secure government portals for each functional team and product team, and enabled USMC office access, as well as provided three secure portals for the industry contract teams. Multiple layers of security minimized risk of proprietary information spillage. IPTs managed their folder configurations and their document storage. ACE provided version control and check-in/out tracking. Due to anticipation for hundreds of contractor deliverables, PM JLTV and TARDEC co-developed a CDRL tracking process in ACE to streamline receipt, review, and acceptance.

2. CDRL Processing

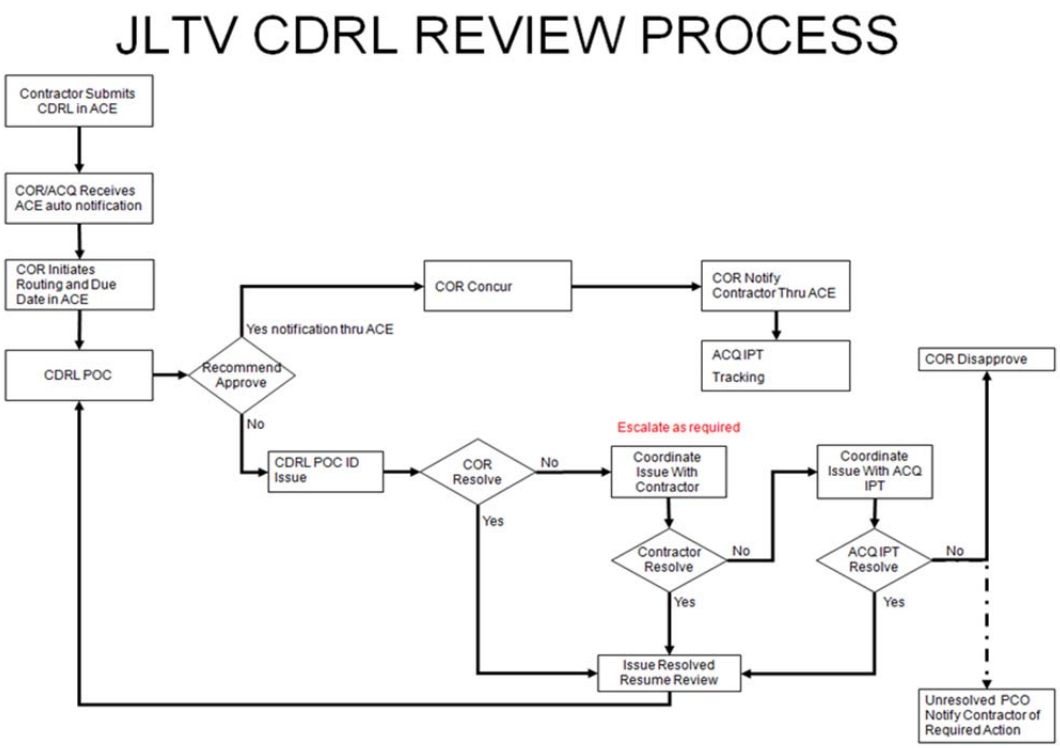

Figure 3. PM JLTV CDRL Flow. From Multiple 2008-9 PM JLTV Program Briefings

The CORs would coordinate preparations prior to receipt, record deliveries and route CDRLs to functional IPTs, assure reviews were ongoing, collaborate on assessments and decisions, process acceptances, and keep the contractor advised on progress. Most data submissions could be posted to ACE. The contractor delivered some by disc with only a cover letter posed to the CDRL folder. The COR gave the deliverable a cursory review that included unique or potentially problem markings. The contractors frequently chose to apply very restrictive distribution statements and markings given the competitive nature of the program. The COR used a JLTV-unique ACE interface to select the appropriate document reviewer point of contact (POC). After completing the review, the POC notified the COR. The system enabled the COR to see occurrence time/dates and run summary level reports.

3. Data Requirements

The contracts required delivery of up to 58 CDRLs items. Each contract Section C requirement for data submission had a corresponding DD Form 1423-1 with specifications, information such as the associated Data Item Description (DID), delivery terms, and format. Most of the CDRL items required a multiple number of deliveries.

a. Examples of JLTV CDRLs:

- Family of Vehicles Producibility Assessment: Required contractor to estimate the unit production cost and technical risks associated with manufacturing. This deliverable would help the JPO address the Producibility ADM requirement.
- Risk Tracking Report: Monthly delivery containing descriptions, estimated severity, and mitigation plans.
- System Specification
- Modeling and Simulation Plan
- Technology and Growth Plan
- Hazard Log: Log of hazards identified through analysis and testing. Each hazard was classified by severity and probability following a contract guidance attachment.
- Reliability Prediction Data
- Vehicle Inspection and Test Plan
- Mine Blast Analysis
- Tester Training Plan
- Commonality Assessment: This deliverable would help the JPO address an ADM requirement to assess logistics support and parts commonality across the JLTV family of vehicles.
- Draft Interactive Electronic Technical Manual (IETM): Less than fully developed TM's to demonstrate capability for using IETM technology to perform vehicle fault diagnostics with links to troubleshooting task descriptions.

B. CONTRACTING OFFICER'S REPRESENTATIVE

COR was a critical position for the product team. CORs monitored contractor performance, helped preserve contractor's rights, explained contract terms, prepared communications concerning contract interpretation and performance, monitored

government-furnished property, and established and maintained correspondence files. Throughout the TD phase the program would continue to be conducted in a competitive environment. The competitive environment would continue during the transition to EMD. EMD contracts also would be awarded through full-and-open competition. The COR was expected to assure that JPO personnel that interfaced directly with industry maintained competition awareness. They helped the Contracting Officer insure that fair and consistent decisions and actions were applied across the three contracts.

C. DEVELOPING AND INTEGRATING RISK MANAGEMENT

A Risk Management (RM) methodology and accompanying tool were developed for identifying, evaluating, and managing JLTV risks. The risk management approach was a way to drive systems engineering in all functions. The methodology employed a comprehensive Risk Management Assessment Structure (RMAS) used to identify and trace risks to various programmatic and technical system attributes. Identified risks were evaluated using JLTV customized severity of impact and probability of occurrence scales. Actions necessary for managing risks were documented and monitored. The process was designed to empower the IPTs to manage their risks. Risk elevation thresholds were defined as mechanisms for raising awareness of risks to higher levels of management as necessary. Details of the RM process flow, job functions/interfaces, and two-phase implementation plan served as the foundation of a JLTV Risk Management Plan.

It became clear early after contract starts that the contractors did not share the same RM philosophy as the JPO.RM Plans were slow to develop and complete. Identifying risks was not appearing as a priority in meetings. The Tracking Reports contained fewer than expected. Effective RM relied on a higher level of openness than was shared.

D. BATTLE RHYTHM

The JPO established a weekly battle rhythm to carry forward into the contract period. The battle rhythm was based on driving disciplined communications throughout the organization. There would be organized communications with a predictable and clear

path. PM leadership was aware that regular meetings and processes were in place to work issues before getting elevated. APM-led product team and functional meetings fed weekly PM-chaired synchronization (or "*synch*") meetings. Information was presented on charts prepared to a standard format, but intended to support a free flow of communication. If charts were current they could support short notice higher level or other ad hoc JLTV briefings. IPT members quickly recognized their roles and flow of communication. The *synch* provided the primary formal exchange across the three contract efforts in a forum that included the USMC JLTV PMO. The *synch* ensured a continual sharing among teams. The JLTV was a program relying on innovation and did not follow a template. The meetings would help confirm that the work was heading in the right direction.

The term battle rhythm aided project management by referring to weekly government-contractor meetings, weekly IPT meetings, and balancing Monday-Tuesday schedules and preparations for Wednesday briefings to the PM. Thursdays were typically available for sub-IPT and special/ad hoc meetings. Fridays were used to get caught up and prepare to do it again on Monday. The term reminded all that there was a process geared to maintain steady progress and they were depended upon to maintain readiness for higher level reviews. It needed buy-in from all participants to include primary and alternate participants. Meeting chairs and leadership could quickly recognize issues that needed action to discuss or work offline. As project activities and agendas became routine they tended to become more efficient in ways that far outweighed where there could be complacency. As an example of the efficiency, after the product teams and JPO settled on metrics, the data and changes became a tool to guide analysis and decisions.

E. START OF WORK MEETING PLAN

The JPO accepted Defense Acquisition University's (DAU) offer to design a Start of Work Meeting (SOWM) format, conduct SOWM format training, provide advice drawn on their experience with similar SOWM formats, and facilitate SOWM proceedings. Using DAU's "New Program Startup Workshop (NPSW)" format (DAU, http://www.dau.mil/homepage%20Documents/npsw.aspx) for JLTV SOWM was also encouraged by the Military Deputy to the Army Acquisition Executive (AAE). There was

some reluctance in the JPO to deviate from the SOWM formats that were familiar to many of the experienced personnel. DAU believed the JLTV program would benefit from aligning Government and contractor teams and then formalizing the new joint teams by developing charters. Key components of the SOWM were:

- Agenda development common for each product team.
- Identifying topic leaders.
- Government briefing development.
- Develop SOWM break out meeting report formats.
- Outline IPT charter templates to be completed during the SOWM.
- Administrative planning to support several hundred participants.

Pre-contract activity resulted in anxious anticipation. It was released when the protest was denied in February 2009 and the product teams were free to contact the three new JLTV contractors. The product team APM leaders immediately met with contract counterparts to:

- Share introductions.
- Exchange contact information.
- Start building relationships.
- Set SOWM dates.
- Plan SOWM success factors and constraints.
- Explain the motivation and expectations for the SOWM and participants.
- Establish awareness of contract issues and insure a methodical approach that will keep issues active until resolved.
- Create action item logs with a numbering system and priorities and due dates.
- Identify issues.

The product teams began parsing contract requirements so functional leads knew their contract responsibilities. Each was tasked to ensure his or her counterparts gained a complete understanding of requirements. The product teams encouraged conducting technical *deep dives* in this period as a way to initiate data flow and collaboration between the contractor staff and the JPO product teams. The PM wanted to assure consistency across the three product teams. The PM looked for efficient use of resources, communication flow, and sharing of good practices among the three product teams. The contractors looked at these early meetings as critical tasks.

F. START OF WORK MEETING

The objectives of the contractually required SOWMs were to begin establishing partnerships, share goals, and hear from leadership on both sides. More importantly it was the government's opportunity to make it clear to the contractors that the primary objective of the TD phase was to develop and validate requirements as well as ensure maturity of technology. Government leadership emphasized that the contract would require openness and shared responsibility for the success of the program. The

contractor's role was to help accomplish that objective. In doing so, despite the competitive environment and anticipated tendency of the contractors to protect their designs and data, the JPO would strive to help them attain a practicable comfort level for sharing the depth of data that was sought. The JPO sought to instill confidence in the ability to protect confidentiality and establish trust.

1. SOWM Participation

The first of the week-long SOWMs took place 15 days after contract start followed by the second and third in the proceeding weeks. The amount of time available for each contractor's meeting and the lead time to prepare challenged them. The total number of government and contractor attendees ranged from 100-120 representatives at each event. Government attendees included JLTV OIPT members from OSD, DA, USMC, and DCMA. Key government and contractor attendees were provided assigned seating. Day one participation included Government and company executives. The Army and USMC PEOs provided their perspectives. The event speakers stressed that initiating partnerships was vitally important to success even though the contract did not require them to be established. The government leaders expressed a commitment to helping the contractor to succeed. Congratulations were heard throughout the week acknowledging the contractor's accomplishment in earning one of the three contracts. Each SOWM lasted four days with a System Requirements Review (SRR) on the fifth. Each day's agenda included a wrap-up of the previous day.

2. SOWM Objectives

The government looked to set a positive tone in a series of presentations. Briefings gave government and contractor representatives the opportunity to describe their perspectives and philosophies. Key JLTV project team leaders began to validate team alignments, set team objectives, and identify a path to achieve project objectives. Government team leaders described and listed the duties of JPO personnel. The contractors later recognized that this early effort to map their PM structures to the JPO personnel became a successful strategy. Taking time to insure the conduct of the proceedings were clear got participants involved in exchanges and outcomes.

3. SOWM Activities

The three contactors confirmed the JPO assumption that the RFP gave them the instruction and program objectives they would need to identify resources and determine what IPTs were needed. The SOWM was the opportunity for the government personnel and contractor counterparts to initiate meeting routines and activity plans and to write team charters containing common objectives and goals that identify who would work together. The charters were in draft form as a result of pre-SOWM JPO activities. The charters were meant to demonstrate a common understanding of roles and objectives, define delegated authorities, role, responsibilities, shared program objectives, key performance indicators, reporting requirements, and contract deliverables. The charters would align organizations culturally and structurally in support of a shared vision. They would become a blueprint for working together and communicating. APMs and IPT leaders created organization charts that aligned government personnel and their corresponding contractor personnel. The contracts contained language requiring establishing and maintaining IPTs. Contractors were expected to keep the government informed of changes to personnel and structures. Product functional leaders for system engineering, C4I engineering, supportability and logistics, test and evaluation, business management, and contracting each chaired a JLTV TD SOWM one-day breakout session. Objectives and tasks were developed in advance for the breakout sessions. The breakouts encouraged both the government and contractor personnel to begin collaboration on team functions, IPT procedures, and battle rhythm. This approach was a departure from focusing on contract execution. The idea was to encourage the contractors to feel a part of the program instead of just conducting a typical customer-provider relationship. The partnership would help the JPO find answers and develop ideas.

Establishing the program cost and schedule baseline was one of the contractor's most critical early tasks. Since the next major event was the Integrated Baseline Review (IBR), one of the major SOWM activities was to discuss the schedule, planning and preparations to determine if the contractors were on track for the event. Careful planning was essential as both the contractors and JPO personnel had little experience with an IBR.

G. POST-SOWM TO INTEGRATED BASELINE REVIEWPERIOD

The JLTV contractors had expectations for the government to practice open communications, and to demonstrate willingness to work as a team. For each, the product team was the primary face of the government. Throughout this period product team members participated in the contractor's regular weekly IPT meetings, started identifying risks or indicators, and continued to assess each contractor's understanding of contract requirements. There was general agreement among the government and industry that the test vehicle delivery schedule was ambitious. The short timeframe to complete prototype design required a high level of activity with frequent interaction. During this early stage, IPT members began reviewing approaches to contract deliverables or reviewing draft reports. Every Monday was a checkpoint and tag-up to discuss plans, activities, and issues. Open SOWM action items were reviewed. A Systems Engineering Management Plan (SEMP) was due in draft form in this period of time. The JPO expected that a well-crafted SEMP would provide an orientation to the contractor's approach and be an early indicator of program development.

The pace offered little down time. This would have been an important period to conduct a SOWM assessment review with and without the contractors. Each product team and IPT should have taken time to review the briefing charts to enable second chances to ask questions. This would also be an opportunity to obtain feedback from contractors once they had opportunity to assess what they heard compared to their priorities and risks.

1. Government-Contractor Battle Rhythm

One of the significant challenges for both the government product teams and each of the contractors was to maintain momentum. The product teams were small task-oriented teams designed to encourage innovation and fast action. Each established a regular weekly meeting with their contractor. A routine day and time was set with a regular location. Meetings with the product teams occurred mainly through internet conferencing. It was recognized that face-to-face was the most effective approach; however, that ability was limited due to geographic barriers and travel cost. A standing

agenda was developed jointly with the contractor and distributed in advance of each meeting. The meeting was intended to discuss higher level issues, progress towards contractor deliverables, upcoming events, and metrics. Each IPT member was expected to accept responsibility and make decisions or recognize when to bring issues to the entire team. Initiative discussions would support the vertical flow of information to the weekly JPO synch meeting as well as identify actions and issues for rapid horizontal flow to the functional teams. The contractors were committed to consistently conduct the primary meeting and sub-IPT meetings on the regular scheduled days to include assigning substitute roles when necessary. The contractors developed a slide package that was distributed via ACE in advance. Live edits were made during the meetings. This was aided by web conferencing tools to support virtual meetings. The final slides were uploaded to ACE within the following two days.

2. JPO Assisting the Contractors

Through the product team meetings and sub-IPT reviews the contractors expected the JPO to help them succeed. The JPO functional support team structure was a new concept to them. They needed to understand the dynamics and determine how best to utilize that program aspect. In particular there was early trepidation about the control of proprietary and other competition sensitive information within the JPO due to in-depth functional personnel exposure to all three contractor's technical data. This was amplified because the contractors were aware that the government was planning full-and-open competition for the JLTV EMD contract. IPT members sought additional early opportunities to meet face-to-face. The program tempo also forced frequent interaction. Contractors were asked to present concepts and provide data that supported their solutions to the personnel that were dedicated to their contract. The contractors needed CDRL guidance and an understanding of government expectations for requirements and submission. As interactions occurred, the teams looked for ways to help solve their problems or identify risks. IPT issues were overcome by not for attribution discussions and early deliveries of draft documents and data. The contractors quickly recognized they could come to the JPO with problems. Some contractor adjustments required them to add and change personnel. The product teams helped by assisting in the orientation of new

contractor personnel to the program. At the same time, the product team's continual assessment of the impact of personnel and organizational changes on contractor system engineering was critical to JPO situational awareness.

3. Contract Challenges Identified

Program challenges began to emerge that ranged from contract issues, aggressive contractor schedules, and technical performance. The JPO learned that the contractors felt that the government sought a TRL 6 JLTV design which was more advanced than industry expected for a TD phase program. The contractors also felt there were too many SOW requirements that described how to design the vehicle. However, contract language provided a means to trade or remove low priority technical requirements through a Trade Study option Aiming to present the best possible TRL 6 design, the contractors found this trade process to be challenging and thus would depend on JPO personnel for advice and questions to help them find solutions, make logical decisions, and submit supporting justification in the form of a Trade Study. Trade studies informed the government on feasibility of integrated solutions to achieve requirements.

4. Metrics Emerge

The product teams collaborated with their contractors to develop project metrics. Metrics became valuable to all weekly meetings. They provided the latest top-level key data points for product team meetings, showed progress, highlighted problems, captured accomplishments, and assured visibility of problems and issues. Examples included: vehicle weight projections, requirements compliance, risks, technical performance measures, and a projected full-rate production Unit Manufacturing Cost. Eventually metrics were used to feed a set of metrics that the JPO developed for program monitoring and assessment. Metrics were a challenging area to develop and work effectively. It was recognized that each team needed to design a set that was unique to their particular relationship. Over time, each product team was able to tap into the contractor's talents. The same results may not have been obtained if the JPO developed a metrics set, which

was the intent for a period of time. That approach may have achieved early standardization, but an opportunity could have missed to leverage the contractor's creativity.

5. Contract Delivery Requirements List (CDRL) Item Management

The product team COR was responsible for managing the 58 CDRL data items. The value of establishing a process proved itself when over the course of TD the three contractors had submitted a total of approximately 1400 individual entries. The CORs insured that the contractors had logical plans for providing the correct information on time. The CORs coordinated preparations prior to receipt, recorded deliveries and routed CDRLs to functional IPTs, assured reviews were ongoing, collaborated on assessments and decisions, processed acceptances, and kept the contractor advised on progress. The CORs collaborated with both the government reviewers and the contractor to develop solutions to rejected submissions. The CORs developed CDRL data bases and metrics for use as tools to explain status updates during weekly IPT meetings. Metrics were also useful for past performance assessments. CDRL review responsiveness was critical to the contractors and they had high expectations for timely, quality reviews, and meaningful feedback.

H. PROGRAM MANAGEMENT REVIEWS

Formal components of project execution were the quarterly PMRs that were held quarterly throughout the contract. Many were held in conjunction with another review. PMRs were usually hosted by the contractors which included locations at both administrative and production facilities. PMRs sometimes included tours and demonstrations. Invitations were extended to many of the JLTV stakeholders as a continuing open communication approach. Common basic agendas across the three contractors were developed by a collaboration of the three product teams. The common approach gave a standard look and experience for PM JLTV management and functional leadership. It provided the JPO an opportunity to focus on a single OEM. For the OEM

leadership it provided the periodic opportunity to address the key government program personnel. The PMRs would show joint ownership of the project by the government and OEMs.

Each government product team member collaborated on a presentation with his or her contractor counterpart. The two then jointly delivered an overview of issues, top risks, activities, and accomplishments, and a project look-ahead to next PMR. The approach resulted in the contractors providing comprehensive briefings in each area. The PMR served as a checkpoint to those involved to reset targets and helped to identify areas critical to meeting objectives. It provided a point where the contractors could discuss organizational and personnel changes, and public affair activities. JLTV TD contractors were large and highly visible enterprises. The JLTV was an important program and they chose to expose their involvement at public events and industry symposia. Action items were recorded all through the PMR. The PMRs would reveal growing or potential issues, challenges, and problems. They would show the JPO how the contractors were working with their major sub-contractors. Actions were reviewed at the end of the sessions and target completion dates were set.

I. AUSTRALIAN PARTICIPATION

At the same time that JLTV Milestone A preparations and reviews were occurring, the U.S. DoD and Australian DoD were pursuing a Project Arrangement (PA), an international cooperative agreement between the U.S. and Australia. The Australian Defence department wanted to participate in JLTV development to include funding acquisition of test vehicles and providing Cooperative Program Personnel (CPP) to support the JPO. The Australian participation presented a unique requirement for TD phase test vehicles to demonstrate right hand controlled versions. At the SOWMs, the PM announced that the U.S. Department of Defense had entered a PA with the Australia Department of Defence concerning the JLTV. Approval of the PA meant that Australia had provided funding to acquire additional test vehicles. In addition, under the PA, Australia would provide military officer CPPs to co-locate with the JLTV JPO and provide program management support. The CPPs provided expertise in engineering, testing, and logistics while serving on Functional IPTs. Acquiring these additional

vehicles meant that the three contractors would be asked to provide a proposed cost. The initiative led to a modification to each contract to develop right-hand drive vehicles for delivery after the contractors completed building and delivering on the initial U.S. Army/USMC order.

J. INTEGRATED BASELINE REVIEW (IBR)

The contractors were required to host and participate in an IBR within 90 days after contract start. Defense Federal Acquisition Regulation Supplement Notice of Earned Value Management System (EVMS) (DFARS, subpart 252.234-7002) allows the IBR to take place up to 180 days after contract award. Reducing to 90 days was considered to permit less time than optimal for a contractor to prepare, but the JLTV program's compressed schedule for the TD phase drove the need for early dates. The basic IBR requirements were outlined in the IMP Accomplishments and Criteria. The IBR was the first major event that would challenge the contractors to demonstrate they had a clear understanding of the contract requirements and EVM was on the right path. The JPO Business Management Office personnel along with the DCMA experts assisted contractor IBR preparations.

1. Earned Value Management (EVM)

EVM was required because of the contract type (Cost-plus incentive fee and that each contract exceeded the $20 million dollar DOD EVM threshold (USD, 2005). EVM was used to integrate costs, schedule, and scope of work to measure contract performance to requirements and goals. EVM tools would provide a schedule risk management method and indicate if a JLTV contractor was likely to overrun costs, or if they were using contract funds efficiently. There were ten CDRLs under each contract directly associated with meeting EVM objectives. In the aggregate EVM would reveal whether the contractor's entire effort was on schedule and within cost.

2. IBR Training

JPO IBR teams were organized and formal training was provided for participants that covered IBR conduct and data products they would review. An IBR was new to

nearly all of the JPO team members who participated. The JPO contracted a DAU instructor to conduct classes. Training covered IBR fundamentals, data items used, and the interview process. It included conducting mock interviews to provide practice and reinforce learning objectives.

3. IBR Conduct

Each IBR began with a government team briefing to the contractor to list and discuss EVM/business management CDRLs, IBR activities, control accounts to be reviewed, IBR objectives, and product data analysis conducted by the government to date. The IBR included government personnel interviewing Cost Account Managers (CAM). These interviews were organized based on the contractor's work-breakdown structures and alignment with functional areas. The JPO developed a standard set of control account oriented questions to collect technical knowledge and data, and to validate EVM knowledge and training. The assessment sought to determine whether the CAMs had control over EVM costs, schedule, and technical content. The government team used the contractor's Integrated Master Schedule (IMS), and conducted DCMA's 14-point Schedule Health Assessment metrics and Schedule Risk Assessments. The analysis looked at whether the IMS included all contract SOW requirements and all CDRLs while clearly identifying all the key project milestones.

4. Integrated Master Schedule

The contractors were required to submit their initial IMS at the IBR. The IMS update became a weekly (or bi-weekly) contract deliverable that each contractor was expected to use for analysis, completing work breakdown structures, organizing, creating staffs, developing risk assessment, and to resource their sub-IPTs and task teams. The IMS forced the contractors to also train personnel lacking EVM skills where needed to support the EVM processes and reports. Each IMS was a complex data base that contained over 2000 lines of information. IMS analysis was capable of providing valuable program metrics and insight into contractor performance. IMS maturity, or the lack thereof, became an indicator of how well the contractor was managing and synchronizing overall systems engineering and finances against the contract

requirements. The JPO emphasized IMS development and use as a critical tool at the IBR and PMRs. Because of early recognition of the IMS importance and a lack of JPO expertise, the PM acquired contractor support to help. This enabled the JPO to actively and frequently assist the contractors with IMS management and analysis. The PM's initiative proved its value early and often throughout the design and build phases.

5. IBR Objectives

The intent of the IBRs were to verify the contractors were effectively using EVM and that the government could understand the basis and derivation of their Performance Measurement Baseline (PMB). The PMB needed to include the complete contract scope of work (SOW) to show adequate resources and consistency with the IMS and IMP, and to reflect that there was not excessive risk. It asked: were the underlying PMB rationales reasonable? The PMB must reflect reasonable rationales, and verify whether the contractors implemented EVM processes, and confirm that the CAMs had the right skill set and direction. The IBR laid a foundation for understanding project risks. It provided an opportunity to compare their approach and systems to the JPO's expectations. It was the first checkpoint for effective partnering to allow early intervention and application of resources where necessary. EVM required the contractors to measure program management execution and to predict cost management trends. The IBR showed that the contractor had incorporated lower level cost and schedule tasks consistently with the contract requirements. Their management could use the accumulation of lower level input to prove that achieving their contract approach projected a reasonable amount of risk.

6. IBR Results

The IBR was an in-depth analysis and assessment to determine if the contractor's managers could demonstrate a logical approach with a sound basis of costs and reasonable schedule. The IBR would validate whether they had an IMS change control and baseline control process. The IMS demonstrated if the critical path was based on logic and if it showed a logical flow to accomplish the technical work scope. It validated that tasks were planned and enabled objective measurement relative to technical progress. Processes were expected to begin in places that would integrate their IMS with work-

breakdown structures and the contractor's basis of estimate. The IBR surfaced where there were manual efforts, presented risks, and if management appropriately implemented processes. The early IBR dates proved to allow program performance issues to surface. The reviews revealed some attitudes among the contractor teams, and provided insight the JPO could use to advise them on their strategies and risks. The JPO did not anticipate corrections, but both minor and major problems surfaced. For the PM, the IBRs would also be indicators of whether the JPO personnel and stakeholders had the projects under proper visibility. The JPO leadership realized that, although unplanned, follow-on IBRs would be beneficial for both the program and contractors for completing actions and achieving a higher level of EVM process maturity. Each IBR ended with a government team providing a briefing to the contractor that summarized accomplishments, risks, concerns, and action items.

K. IBR TO PDR PERIOD

IBR action items were worked and closed by the product team and contractors. Some actions were assigned to government-led sub-IPTs. The contractors attempted to make adjustments to priorities, schedule, resources, and management processes based on IBR feedback while preparing for the Preliminary Design Review (PDR). The contractors determined when to conduct the PDR. This was a critical decision point. Selection of a PDR date would mean assessing the design maturity progress, determining when the designs could be adequately described in a formal review, and showing they were ready to start submitting the initial wave of CDRL items that were due at PDR. The IMP listed primary activities and sub-activities expected to be addressed at PDR along with associated CDRLs. Using the terms: completed, conducted, drafted, established, updated, or understood, the IMP outlined the contractor's program performance expectations.

This was the period where the JPO expected to see the contractor's transition from a planning stage and telling the government what they will do to a ramp-up in vehicle development activities. Processes supporting information exchange were defined and refined. IBR action items were worked and closed. The identification of risks was expected to grow. The period was short which seemed to force the contractors to continue

the brisk pace the JPO desired. If the transition and pace were not demonstrated, then PM intervention or further elevation within the management chain would be appropriate.

1. Purchase Description Tiers

The JLTV TD contracts were intentionally designed to allow the contractors room for interpretation and encourage innovation where it made sense. Each PD requirement was assigned a 1, 2, or 3 priority (1 the highest). These priorities were known as tiers. This tiering arrangement gave the contractors a general guideline. Tier 1 requirements were related to or directly associated with JLTV CDD Key Performance Parameters. The tiering would force the contractors to stretch their design capability and thus inform the requirements process, while allowing some trade space. Therefore, the tiers indicated that the program was seeking to meet all threshold level KPPs. Through the Trade Study process, the contractors could choose to downgrade, propose alternatives, or announce a non-compliance with any PD specification that they could not meet. Each Trade Study was required to be submitted according to a CDRL. The 1200+ specifications were tracked at the macro-level using a Requirements Compliance Matrix data deliverable.

2. PDR Issues Assessment

Product team members were responsible for continual assessment of contract performance in their functional area. They looked for evidence of a methodical approach for developing PDR presentations and conducted assessments of whether the PDR would meet IMP criteria and expectations. They were expected to report and provide advice to the JPO IPT leads. It was incumbent upon them to join the contractor IPTs and become an active participant. The program depended on timely and accurate knowledge of contractor progress. The PM needed to know when and where to step in to understand issues and risks.

L. PRELIMINARYDESIGN REVIEW (PDR)

PDR was the first of the two formal design reviews. These were four-day forums which involved JPO management, JLTV program stakeholders, and other government functional experts. The three events for the TD contractors were comparable to the

SOWMs in attendance. Scheduling the necessary key personnel created challenges for the JPO due to a need for most government participants to attend all three. The PDRs served as a comprehensive presentation of vehicle design progress and subsystem integration. These also were checkpoints to assess whether contractual requirements were understood and being met. The contractors were required to present data, 3D models or drawings for the vehicles that would be built and for those in which the contract only required delivery of PDR-level design data.

1. PDR Content

The contractors prepared in-depth presentation materials supported by a major delivery of CDRL items. PDR briefing topics included:

- System level design
- Requirements compliance metrics
- System architecture
- Detailed designs for each JLTV category
- Vehicle structures
- Survivability subsystems
- Modeling and simulation results
- Supportability concepts
- Reliability and maintainability engineering
- Human factors analysis
- Safety design and assessment
- Hazardous materials use
- Build plans
- Test plans
- Major subsystems detail
- Vetronics architecture
- Software development
- Technology growth.

The PDR measured contractor project management and began providing to the government the design information needed to start informing the requirements processes. Each contractor conducted dry runs with the product teams to preview briefings as much as possible.

2. PDR Objectives

PDR objectives were listed in IMP. The JPO would determine whether presentations and data were consistent with contractual terms. The PDR reinforced understanding of technical aspects and would help to validate horizontal integration and reveal its effectiveness across the contractor's sub-IPTs. Evidence of horizontal integration enhanced credibility of their design process. The quality of certain deliverables and their presentations provided a view into the inner workings of their program. Those key PDR deliverables included the System Engineering Management Plans, Risk Management Plans, Configuration and Data Management Plans, and Modeling and Simulation Plan along with initial delivery of modeling and simulation data. In a rapid development program these documents were expected to be well developed and capable of guiding contract execution. The PDRs enabled the government to conduct a critical analysis of the contractor concepts. The government assessed those areas that allowed latitude towards meeting contractual requirements, quality of PDR presentations, IMP criteria accomplishment, IMP deviations, quality of CDRLs, contractor's risk management approach, feasibility of completing designs, and indicators that the contractor would produce hardware in accordance with contract delivery terms. PDRs marked their higher management's first opportunity to assess their program team's performance and preparations.

3. PDR Results

PDRs presented the government with advanced design maturity, potential program issues, and risks. They indicated areas that the JPO could influence. It proved to be a plus that the PDRs were conducted at the contractor's facilities by providing access to personnel who may not have traveled to the JPO location. The locations allowed all key JPO personnel and program stakeholders to see contractor facilities that provided a

better feel for what the contractors were doing. The PDRs showed contractor processes for conducting design trade, which resulted in producing supporting logic that was presentable to the government and complied with the CDRL. The contractors demonstrated which data deliverables would become critical during production and hardware manufacturing along with development status. For the most part, the PDR presentations were consistent with contract proposals. The reviews also confirmed that the JPO's concerns about several technical risks were valid. Each contractor had difficulty meeting weight limits and was exploring tier trades that the JPO considered to be unpalatable. Recording PDR action items satisfied contract requirements to record minutes.

The government assessed progress since SOWM, near-term activities, and the path ahead to vehicle production planning. The PDR exposed areas needing more maturity and work that were not apparent during SOWM and IBRs. The PDR challenged the government to ask probing questions, identify risks, and assess whether critical actions are planned.

M. PDR TO CDR PERIOD

If the JPO had not made it clear until the PDR that the JLTV program fully intended to meet its schedule, was committed to controlling cost, and was confident in the future requirements, it seemed loud and clear in the post-PDR period. The PDRs produced numerous action items, CDRL item revisions, and necessity for additional meetingsMaintaining budgets began to challenge them in this period as assumptions were validated and some risks were realized. The contractors' own PDR objective was to set themselves up for CDR preparations immediately after concluding PDR was revised. Once again, they were allowed to set the date, but they knew the government had much higher expectations for the CDR than they did for PDR. The trade process gave them options. Options could save time, reduce costs, and enable a course of action. However, the JLTV's competitive environment would silently influence design solutions.

The contractors learned that close discussions with the JPO were necessary and to value collaboration. They recognized the benefits of the JPO's support and teaming in the

reviews. During the period leading to the CDR, the contractors were expected to refine designs, address quality of deliverables, plan for next wave of CDRL deliveries, plan for long lead time materials and parts, engage sub-contractors, initiate production planning, and use their risk management processes. The government looked for evidence that the design was maturing as expected. The amount of information the program was obtaining helped JPO personnel begin to develop greater JLTV expertise. It also helped confirm what subject matter experts were needed and when. The PDR and data deliveries began exposing the Requirements IPT to the designs and solutions which would support the KP that followed.

N. USER JURY

The JPO sought opportunities for soldier and marine representatives to become actively involved. Terms were included in the contracts to require a User Jury. These were held at the contractor's facilities during the time between PDR and CDR. The contractors were tasked to use any form of mock-ups or prototype crew compartments to conduct hands-on evaluation by teams of soldiers and marines who represented the types of users who will operate JLTVs in the future. The JPO arranged for the teams to be available for several days at each contractor's site. The contracts required a detailed User Jury plan to accomplish expectations that were listed in the IMP. The plans concentrated on human factors design elements, such as access, egress, seat adjustments and belts, visibility, gauges, and controls. JPO personnel were on hand for each event.

O. CRITICAL DESIGN REVIEW

Like PDR, the CDR gave the contractors some clarity on areas that were open to interpretation. The JPO developed a CDR format suitable for the JLTV TD phase. The primary purposes were to continue gaining design information that would aid the next KPs and to influence prototype test planning decisions. The contractors were interested in how well they performed, but the government was somewhat vague about how or whether they would evaluate CDR success. The contract provided a brief requirement to present their detailed designs and modeling and simulation results. The contractors were expected to demonstrate their preparations for beginning test vehicle production phase.

1. Content

CDRs were conducted similarly to the PDRs with the same participants plus executives from government and industry. Content was based on the IMP criteria. Product teams collaborated with their contractors to develop agendas. Lessons learned from PDR were incorporated. The final versions for the three CDR agendas were similar. If the PDR was well done, the CDR was still expected to be better. To help accomplish that, the JPO product teams actively participated in the OEM's internal peer reviews in the weeks preceding the CDR. In addition, the JPO looked for continued improvement of CDRL quality. The contractors seemed to welcome brainstorming, bluntness, and transparency. Presentations included 3D models and addressed:

- System overview
- Requirements compliance
- Transportability
- Key performance parameters
- Risk management
- Technical growth
- Human factors
- Safety
- Modeling and simulation
- Supportability concepts and deliverables
- Test vehicle build
- Integrated Master Schedule
- Test plans
- Detailed designs for each vehicle category
- Survivability
- Vehicle subsystems
- Software
- Command and control subsystems.

2. Objectives

Problem-solving processes were demonstrated. Contractors were expected to show where risk management was being applied, and that issues surfaced as risks first. The JPO looked to validate that resources were in place to intensively manage problems. The last days of the CDRs included an assessment of whether the contractors appeared to be ready to deliver vehicle designs to their procurement and manufacturing groups. The government leadership provided feedback on the last day on positive areas, constructive criticism, risk areas, continuing issues while restating a commitment to their success that was expressed at SOWM.

3. Results

The CDRs occurred approximately six months after contract awards. With just six months remaining to hardware delivery they served as progress checkpoints. Presentations were more polished than the PDR from four to five months earlier. However, the CDRs lacked depth in some areas compared to PDRs. This may have been due, in part, because the CDRs were not held at the contractor's facilities. There were missed opportunities to tour the system integration lab, demonstrate simulations, and view testing projects. While enabling some course corrections, the events did not reveal many risks for the vehicle build phase. The CDRs provided the contractors a better understanding of some evolving JLTV CDD requirements. It gave them clarity and emphasized priorities.

P. CDR TO TRR

1. Vehicle Build Phase

The post-CDR period leading to Test Readiness Review (TRR) was more outcomes-oriented compared to IMP-scripted events such as IBR and CDR. Design data delivery reduced as CDR actions closed out and each contractor transitioned to production. With the exception for meeting a final inspection list, quality controls tailored for prototype manufacturing were not specified in the contracts. The contractors would be given greater latitude for quality control for these stall-built vehicles than would be expected with production representative vehicles assembled for a First Article Test.

Similarly, the contractors were required to deliver minimal data to show production planning and readiness. The product teams encouraged the contractors to develop new metrics for weekly meetings and PMRs. As a result, each government-contractor team tended to develop unique production metrics and reports. The JPO and product teams continued to use IMS analysis, EVM tools, along with production metrics to assess progress. Product team members continually evaluated technical data, program information, schedules, and production status in order to assemble a comprehensive viewpoint.

2. Government Participation in Build

Despite the lack of contractual terms, the product team relied upon active engagement to maintain build progress insight. Product team members conducted frequent visits to the plants during production. They reviewed work instructions and asked probing questions. JPO personnel participated in the contractor's daily procurement meetings. DCMA quality assurance representatives helped provide JPO with insight through meeting attendance and daily observations. PMRs were conducted at the manufacturing facilities. As a result of the proactive approach, the teams were able to surface and identify specific build phase risks that were emerging and would enable management to make informed assessments and take actions.

3. Competitive Influences

The competitive environment was applying pressure to meet schedules. Before, and shortly after CDR, the contractors were making design trades. These included program trades of costs, manpower, testing, quality control, risks, and schedule. Cost constraints were constraining how contractors did business. Competitive pressure held the strongest influence over the contractors at this point. None of the three wanted to deliver vehicles late. As a result they chose to reduce the amount of pre-delivery testing, known as the Shakedown Test. The contracts enabled that choice.

Q. TEST READINESS REVIEW

The Pre-TRR and TRRs were the last major program events before vehicle deliveries and the prototype test. The product teams were actively helping contractors to meet the program schedule. Contractors were conducting their tests while the prototype build continued in high gear. Critical events such as final vehicle inspections, tester training classes, vehicle acceptance and shipments, vehicle characterizations, employing field service teams, conducting an Overarching IPT, and media events were being scheduled. JPO members continued to volunteer skills and abilities, and take ownership of critical tasks.

1. TRR Conduct

Conducting TRRs were dictated by Army Regulation 73-1. They were decision gates to ensure test readiness was met and exit criteria were established. TRR preparations and objectives were guided by the IMP. They would support the PM's decision to proceed to test. A Letter of Instruction (LOI) was prepared to establish the process that assesses whether JLTV test vehicles, personnel, ranges, and all other resources are ready to be committed to Government Vehicle Testing with safe and manageable risks. The LOI guided the contractors through the conduct of Pre-TRRs and what to address at the TRRs. TRR success criteria and briefings included:

- Vehicles had been accepted.
- Vehicle test limitations and constraints were identified.
- CDRL status.
- Status of required subsystem testing.
- Shakedown results.
- Shakedown issues or acceptance deficiencies corrected.
- Government-Furnished Equipment and special purpose kits were incorporated.
- Field Service Representatives (FSR) to support test were ready.
- Spares parts, special equipment, and tools were available.
- Tester training packages were ready.
- Operators manuals were available.

- Safety report with all hazards and warnings identified was ready.
- Contractors had funding available to support full duration of the test.

All TRRs were conducted well enough to enable the PM to make three test readiness decision risk assessments. As a result, each contractor team gained approval to proceed to test.

R. TEST PHASE

In April-May 2010 each contractor delivered the test vehicles in accordance with the contract deadline. A sample from each contractor was displayed in the Pentagon courtyard for one day. This event was followed by VIP and media "ride and drives" at a test center. Within three months later, the Australian right-hand drive versions also also delivered on time. A total of 46 JLTV vehicles and trailers were eventually in test at the same time at U.S. and Australian test centers from May 2010–June 2011. Testing required intensive planning and schedule management by the Government Test and Evaluation IPT. The contractors relied on a continual effort by the IPTs to provide assistance with resolving problems. Test results continued to influence the specifications development, CDD Requirements process, and KPs.

VI. CONCLUSIONS

A. TECHNOLOGY DEVELOPMENT RESULTS

The JLTV JPO utilized the three competitive prototype contracts to accomplish the key TD tasks: JLTV prototype design, development, modeling and simulation, testing, and validating requirements. The three contractors produced prototypes with unique aspects that were suitable for testing and delivered them in accordance with the terms of the contract schedule JLTV unit manufacturing cost information gleaned from the phase increased estimate confidence and enabled presentation of will/should cost analysis for the milestone decision and program life cycle. Program processes were verified or improved. JPO personnel gained valuable system engineering skills and experiences that will benefit the JLTV program in the future. A tremendous amount of data was collected which continued to be used for the technology readiness assessment, requirements processes, affordability decisions, and program milestone documentation. The program increased confidence in operational performance through test and evaluation of actual performance capabilities. Soldiers, Marines, and Australian Army personnel were involved during multiple evaluation events. Cost, schedule, and technical risks were identified or mitigated throughout the project. EMD risks to be carried forward will influence program strategies and plans.

Information from the TD phase has significantly changed the requirements moving forward into EMD by updating, reducing, or eliminating non-essential capabilities. Difficult trade-offs became necessary. The program learned through TD that requirements were not effectively aligned with the initial vehicle categories and missions. RFP language was described in tiered performance terms which forced contractors to develop some creative approaches. Some strategies contributed to a contract management effort more significant than projected. Approximately 30 modifications were awarded to each contract. Some were driven by unforeseen requirements for additional hardware. Some were driven by financial reasons and Australian participation that did not solidify until after the contract starts.

B. OBSERVATIONS

Even though the three contractors involved were large defense businesses their program teams lacked experience with this type of contract for ground equipment. It required a learning curve that was not factored into the TD schedule. The JPO-contractor relationships required a high degree of openness given the many performance-oriented requirements. TD required a rigorous application of system engineering and integration. Acknowledging that fact led to obtaining the data and knowledge the JPO sought. Many lessons were learned that will directly contribute to the planning and conduct of the next and future phases.

Contractors saw the JPO's commitment to success throughout the contract periods. It started with a promise at SOWM followed by the JPO's demonstration of commitment to support throughout. This commitment was demonstrated through frequent collaboration on problems to witnessing government personnel speaking up on their behalf. The government promised to carefully manage their critical information and proved it through processes and action.

JLTV TD demonstrated that competitive prototyping can work. The three contracts were awarded using full-and-open procedures. The government made it clear to industry that the future JLTV contract would also use a full-and-open strategy. As a result competition was being driven by real performance on actual hardware. The program leveraged the environment. There were few disagreements of whether work was within scope. The competitive strategy kept the emphasis on the contractors to meet cost and schedule and work effectively with the JPO. No one wanted to be late to the Pentagon or experience the potential ramifications in the media.

C. PLANNED OR UNEXPECED KEYS TO SUCCESS

The JPO felt empowered. Because competitive prototyping was new, no one could rely on the norm to tell the JPO they were wrong. The JPO sensed in the chain of command that if a plan was presented, it would get support. However, the JPO did not get a free ride and had to work hard to win and retain stakeholder support.

There were environmental influences during TD that may have provided major positive competitive factors. A new formal process and data base known as the Contract Performance Assessment Rating System (CPARS) was deployed. The JPO would prepare annual CPARS input for each contract. CPARS results were intended to be used in the competition for the next JLTV contract. CPARS information would also be available for other government source selection efforts where the TD contractors were involved. Secondly, Mine Resistant Armor Protected (MRAP) vehicle procurement was beginning to diminish as the requirements to support deployed forces were being filled. JLTV market research and TD experience showed that many of the same companies with interest in JLTV were also involved in MRAP competitions or support. JLTV provided a potential new market. Thirdly, budget supplementals used to modernize much of the Army's medium and heavy tactical vehicle fleets were ending, and budgets for tactical vehicles were forecasted to downsize in the future years.

D. ANALYSIS OF JLTV KEY TENETS FOR EMD OR OTHER COMPETITIVE PROTOTYPE PROGRAMS

The results of the JLTV TD design and build phase validated or emphasized some program management lessons learned that could be applicable to the EMD phase or other acquisition programs with a TD phase.

1. Requirements Process Effectiveness

Establishing the Requirements IPT, RMAP, and a series of KPs were right for the JLTV program. As a joint program it would continue to have conflicts over costs, schedule, performance, requirements, and the acquisition strategy. JLTV had many potential solutions or methods, and much left to prove. Planning and conducting the KPs was a rigorous effort that demanded participation. The Army and USMC PEOs and service leadership had a formal process that they could confidently use to evaluate, decide, present, and defend the program.

2. JLTV JPO Organizational Structure Effectiveness

The JPO was organized to spark forward thinking that would identify risks or capture and analyze lessons learned while developing and revising plans. The three simultaneous contracts all with the same requirements and schedules created friendly competition among the product teams. The situation also leveraged applying the best approaches to tasks and problem solving. The office staff was often shorthanded because demands kept growing. It managed an acceptable readiness state for higher level reviews because of a methodical way of capturing information and channeling it to prepare and then support the reviews.

Team leaders were given a great deal of supervisory latitude which freed the PM and DPM to focus less on administrative matters. Functional leads could assess capabilities and identify SME gaps. Then develop a proposed approach, coach, train, or seek people with the needed skill set to address the gaps. Task delegation decisions could consider opportunities to develop new skills for the JPO. Team leaders were responsible for initiating most rewards and recognition. The program depended on creativity and initiative, therefore, it would have benefited from a guiding policy or other means to nudge leaders where appropriate, such as recognition at PMRs.

Product team members who also belonged to a functional team were often pulled in two directions by the organization structure. As a result the product team leaders were often challenged to negotiate common ground with functional leaders. Both product and functional IPTs reported more in the vertical direction while assuring the horizontal communication flow was sufficient.

Functional teams had a tendency to be stove-piped because leaders, specialists, and senior managers focused on the team’s objectives. Some teams did not have a broad mix of functional specialists and were not true IPTs. Functional leads may not have realized they had power to decide how or when to involve the other functional IPTs and product team, such as attending meetings, working tasks, or visiting other agencies and companies. Functional leaders tended to be focused on their area and did not always consider impact on other teams. However, it was not always the functional leader's fault. Product team leaders also influenced team member participation. In one example, the

T&E IPT performed vehicle delivery oversight at the same time government testing was being planned. Product teams needed a production manager and a T&E manager, not one manager to perform both functions.

Synchronization enabled a process-oriented organization for report out, metrics collection, metrics analysis, and problem resolution. The 120-day calendar review became the single most valuable tool in the process because of the busy program and contract management schedules. All leaders were free to present concerns and issues at the synch meetings without prior discussions with other teams. Coordination meetings among team leaders were not part of the JPO battle rhythm. The synch meeting could work effectively on many levels and helped with the horizontal flow but could drive leaders to decide to hold concerns for the next meeting. This became one of the primary reasons the meetings might exceed scheduled time. Synch meeting did not have a set end time and could last for three hours. It satisfied the PM's need for information, but would have been improved with more consistent recording of minutes and action items.

3. JLTV STRATCOM Process Effectiveness

Establishing and following a JLTV Strategic Communication supported a philosophy to use the frequent major events as opportunities to correctly and consistently present the facts. It insured JPO, stakeholders, and contractors knew about the importance of key events. The product teams were expected to assure that contractors were on board. Much of the approach was based on marketing techniques. Information customers (media, industry, service and OSD staffers, congressional staffers) could rely on the strategy if the plan was followed. However, establishing and maintaining STRATCOM was a commitment and would require buy-in from future JPO leadership. It creates new risks if accurate information is not available and customers need to seek other sources.

4. Application of Battle Rhythm Concept

Execution of battle rhythm with the contractors was determined by the product teams. There were no written guidelines. The three APM team leaders often discussed strategy, methods, and results. Battle rhythm created a continual awareness that the interaction with the government team had a direct influence on the path of the program as

the contractors gained understanding that the PM had this battle rhythm strategy. Government and contractor leadership were aware there was a mechanism that maintained a flow of exchange and could keep them current. It did not necessarily allow PM leadership and contractor counterparts to relax their engagement, but it enabled more meaningful interaction and efficient agendas. Some momentum was lost following the SOWM. More frequent interaction was needed to gain mutual assurance that contract language and design requirements were clearly understood and government-contractor relationships developed quickly. Each IPT must use a system to record and work action items until completed or closed. A consistent approach across IPTs and contracts would aid accuracy and utility. Requiring weekly reports and chart updates even when regular meetings are cancelled would have helped to maintain the activity level.

5. Effectiveness of Integrated Data Environment

Shared server drives and ACE were adequate interim repositories; however, the JPO was missing a plan to guide decisions and aid research for archiving project data. The amount of data that was accumulating also pointed to a need for a documented data configuration management strategy. It became clear that a more comprehensive IT solution would be needed to support the next phase.

6. SOWM Effectiveness

According to DAU's website, the "New Program Startup Workshop" was designed to "create an environment of teamwork, collaboration, communication and trust." DAU recommended an agenda that had been designed and conducted for other ACAT I program kickoffs. The three SOWMs were major events in the forming of a future MDAP. Together they formed a JLTV strategic event suitable for the DAU concept and executive-level attendance. The concept helped established a clear understanding of the project foundation for each of the three projects and emphasized teamwork that would be needed. The SOWM laid out challenges and some high level risks that the government was looking for industry to help solve. The government

introduced expectations for communication and the battle rhythm concept. Expressions of honesty and inviting the contractors to embrace program ownership both sought to begin building trust.

The NPSW objectives seemed to be based on a premise that the government lacked a supportive environment with the new contractors. The government had already completed successful JLTV R&D projects with two of the contractors. And TACOM had a long positive history with all them on other ground vehicle programs. The source selection process succeeded with choosing from among a capable group. Less time should have been allowed to share the message about teamwork, collaboration, and trust. Team building would likely have occurred through less formal opportunities. More time was needed for schedule details, battle rhythm, technical approach, and meeting contract requirements. Some participants could have concluded these areas were purposely de-emphasized and some critical messages were buried. Break outs should have been shorter and more focused so the right people were available. The agenda should have allowed margin for unscheduled briefing or meetings. Action items should have been reviewed at the end of each day while issues were fresh.

The SOWM concepts were good, but the JPO was a shorthanded staff tasked with an ambitious 15-month schedule. The JPO was severely challenged to accomplish three week-long meetings. The time and opportunity while all the right people were available needed a more efficient agenda to enable discussion of the contract, risks, plans, and schedule development.

7. Earned Value Management Effectiveness

IBR success might have benefited from a simulation or walk-through of the proceedings leading up to the IBR. A practice session would have likely surfaced some actions or issues prior to the events.

EVM data and analysis it required provided timely insight into costs and schedule health. The data provided some of the cost analysis support required for budget, OIPT, and other pre-Milestone B reviews. The process required analysis of cost by account managers at the lowest levels. It supported accurate metrics reporting through the analysis required by both the government and contractor of vertically traceable variance

explanations. EVM required development and periodic submissions of the Integrated Master Schedule which was integral to the cost data. The initial data submissions should be a check point for the product team to study what the contractors provide, who in the government will use the information, how it will be used, and how analysis will help the program. The value of EVM artifacts should be clear to the product team members well before the IBR.

An IMS for a complex project like JLTV prototype development cannot be well-developed without a top to bottom integrated effort. An analysis of critical path, predecessor/successor task logic, float, durations, change management, and consistency with reports and presentation material can provide a direct reflection of contractor program management maturity. The JPO and DCMA used the IMS as a basis for contractor performance assessment and to determine if work required under the contract was identified and consistent with the IMP framework. Contractors were required to perform regular IMS assessments. These provided additional insight into contract execution planning, activity integration across teams, and program management. Fully developing an IMS required input from all technical teams, leaders, contract management, business management, and program management. Flaws and weaknesses identified by the JPO IMS analysts suggested contractor performance issues and risks. IMS analysis complemented EVM reporting, risk management, and PM business management activities. Positive trends in IMS development and attaining an acceptable level of quality increased the PM's confidence.

8. Requirements Trade-off

Deciding purchase description tiers is a labor intensive effort, but the effort pays off in many areas. It will lay ground work for trade-off analysis and reviews. The eventual JLTV design would be unique in many ways from legacy tactical wheeled vehicles. The still developing protection, payload, and performance requirements could have become even more difficult to achieve in the next program phases. The tiering concept was understood by the Combat Developer stakeholders and supported Key Performance Parameter decisions. The method provided the JPO with a systematic approach for managing and prioritizing specifications.

9. Risk Management Effectiveness

As time passed, the contractor's planning mistakes had a broader impact on the schedule, costs, and tasks. This reality seemed to accelerate after PDR. The product teams were challenged to constantly assess and surface potential problems. The high schedule tempo needed wide-eyed risk identification. Implement a risk strategy through the following: building trust and openness; conducting risk training early on; requiring early delivery of a final risk management plan; ensuring early implementation of risk management; putting project plans and tasks through a risk test; and seeking ways to adjust the process and expectations. The system engineering management plans documenting the Risk Management process should have been finalized earlier. The SEMP was the playbook. Completion would have helped verify there was a comprehensive and logical approach.

E. CONCLUSION

Forming the JPO demanded a bottom-to-top strategy built around a proactive approach, establishing teams, and setting a tempo to keep lines of communication open. Preparation of good quality and properly staffed Milestone B was a significant expectation during competitive prototyping in TD. The documents would be touched by many hands at stakeholder agencies within the DOD. The strategy was designed to create opportunities to engage stakeholders as early as possible and influence the outcomes. Future JPO leaders would need to recognize their predecessors' intentions, utilize the ground work and strive to continue expanding the network. JLTV was still not a program of record, and as a future MDAP the program was vulnerable to setbacks due to continuing changes in acquisition policy. It was thought that those risks might be mitigated as people understood what it meant to be considered a JLTV stakeholder and they used their authority to maintain access to current information. The Milestone A process and pre-Milestone B activity provided exposure at USD (AT&L) and helped to keep program leaders knowledgeable and prepared to be in compliance with the WSARA (Weapon Systems Acquisition Reform Act, 2009), in such areas as competitive prototyping and trade-off analysis of cost, schedule, and performance objectives for the JCIDS process.

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