

# **DRAFT ANNEX H**

## **OPERATIONAL MODE SUMMARY/MISSION PROFILE (OMS/MP) ANNEX**

**To**

**PURCHASE DESCRIPTION (PD)**

**FOR**

**JOINT LIGHT TACTICAL VEHICLE (JLTV)**

**VERSION 2.3**

**27<sup>TH</sup> APRIL 2010**

# 1. Introduction

## 1.1. Purpose

The Operational Mission Summary/Mission Profile describes the anticipated missions, roles and environments the Joint Light Tactical Vehicle (JLTV) will encounter during Full Spectrum Operations. This OMS/MP describes system modes, mission profiles, and usage conditions for the JLTV during its operating life. When approved, it supersedes the OMS/MP published with the JLTV Request For Proposal (RFP) in February 2008, but will not take effect until JLTV EMD phase activities. The OMS/MP supports the basis for essential capabilities described in the JLTV Capability Development Document (CDD) documenting key usage factors directly applicable to design study, logistical analyses, O&S estimation, and reliability, availability, and maintainability (RAM) testing and analyses. JLTV is a Family of Vehicles (FoV) with various subconfigurations designed to perform specific mission roles (weapons carriers, ambulances, shelter carriers, etc). To clarify the OMS/MP vehicle requirements, an archetypical vehicle is selected as the base mission profile using a weighted average.

## 1.2. Document Overview

The OMS/MP defines the following:

- Expected operational modes.
- Full Spectrum Operations, Operational Themes, and elements of the operational terms (offense, defense, and stability).
- Joint Mission Profile and operational elements.
- Terrain conditions in terms of mileage, speed, and roughness.
- Environmental conditions.

# 2. Operational Mode Summary (OMS)

The combination of tactical activities and system states (modes) is referred to as an Operational Mode Summary (OMS) and reflects the **most typical and demanding** operations during the three elements of the operation within Major Combat Operation (MCO) and Irregular Warfare (IrW). The following operational modes apply to the JLTV FoV regardless of the Mission Role Variants (MRV) or mission<sup>1</sup>:

- **Dynamic Operation or Movement Time:** vehicle is actively moving with all systems energized.
- **Static Operation or Idle Time:** vehicle is stationary with engine running, mission essential systems energized.
- **Silent Watch Operations Time:** vehicle engine is off with mission equipment energized by battery power.
- **System and Engine Off Time:** means the vehicle is stationary and all systems and engine are shut down.

Other Key Definitions Include:

- **Duration:** Total time in hours accumulated during a task.
- **Distance:** Total distance in miles accumulated during a task.
- **System Cycles on/off:** Number of times the vehicles engine is turned on and off.
- **Terrain:** The different terrains the vehicle is expected to perform on

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<sup>1</sup> Other modes exist that were considered insignificant or irrelevant to the JLTV operations.

### 3. Operational Context

#### 3.1. Full Spectrum Operations

The foundations for Military operations are contained in its operational concept—full spectrum operations<sup>2</sup>. The goal of full spectrum operations is to apply land power as part of unified action to defeat the enemy on land and establish the conditions that achieve the joint force commander’s end state. The complexity of operational environments requires commanders to combine offensive, defensive, and stability or civil support tasks to complete these operations. In all operations, the objective is to seize, retain and exploit the initiative while synchronizing actions to achieve the best effects possible.



Figure 1. - Spectrum of Conflict

#### 3.2. Operational Themes:

Operational Themes consisting of MCO, IrW, Peace Operations, Limited Intervention and Peacetime Military Engagement characterize the missions that will be supported by JLTV. Each theme has a distinct mode profile with various terrain profiles and speeds.

#### 3.3. Elements of Full Spectrum Operations

The JLTV was modeled using the operational themes of MCO and IrW. Both themes consisted of a number of different mission tasks within the three elements - Offense, Defense, and Stability or civil support. Full spectrum operations require simultaneous combinations of three elements, each at a different intensity as illustrated in Figure 2. These elements are described below

<sup>2</sup> Field Manual No. 3-0, Operations Headquarters Department of the Army Washington, DC, FEBRUARY 2008

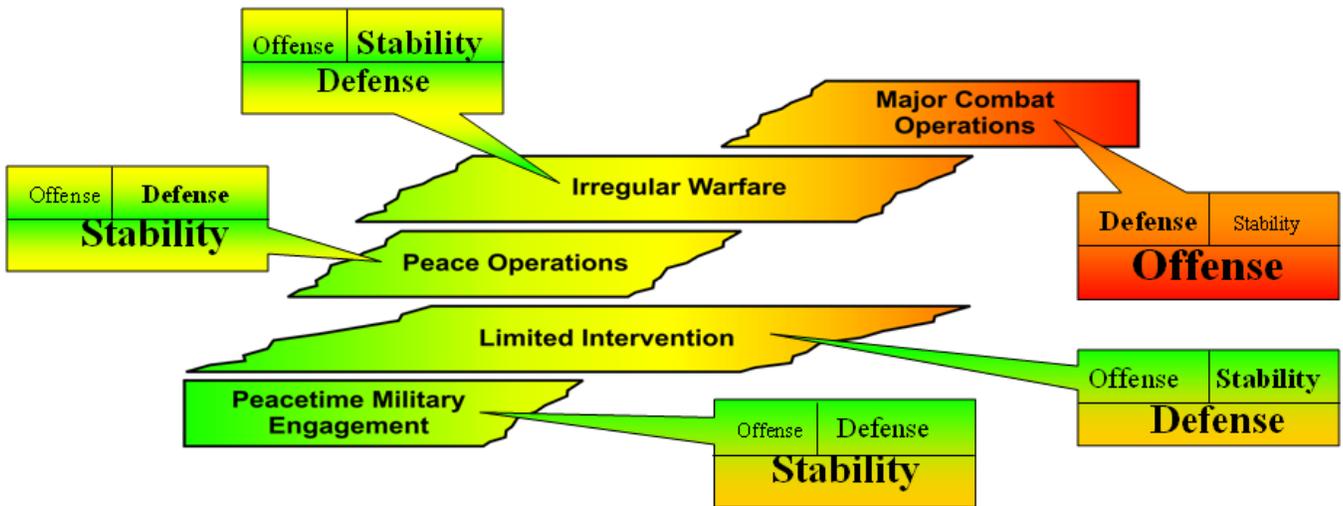


Figure 2. - Elements of Operations within Operational Themes

### 3.3.1 Offensive Operations:

Offensive operations are combat operations conducted to defeat and destroy enemy forces and seize terrain, resources, and population centers. In combat operations, the offense is the decisive element of full spectrum operations. Against a capable, adaptive enemy, the offense is the most direct and sure means of seizing, retaining, and exploiting the initiative to achieve decisive results. Executing offensive operations compels the enemy to react, creating or revealing weaknesses that the attacking force can exploit. Successful offensive operations place tremendous pressure on defenders, creating a cycle of deterioration that can lead to their disintegration. Primary tasks for offensive operations consist of the following:

- **Movement to contact:** Movement to contact develops the situation and establishes or regains contact
- **Attack:** An attack destroys or defeats enemy forces, seizes and secures terrain, or both
- **Exploitation:** An exploitation rapidly follows a successful attack and disorganizes the enemy in depth
- **Pursuit:** A pursuit is designed to catch or cut off a hostile force attempting to escape with the aim of destroying it.

### 3.3.2 Defensive Operations:

Defensive operations are combat operations conducted to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations. The defense alone normally cannot achieve a decision. However, it can create conditions for a counteroffensive operation that lets joint forces regain the initiative. Defensive operations can also establish a shield behind which stability operations can progress. Primary tasks for Defensive Operations consist of the following:

- **Mobile defense:** The defender withholds a large portion of available forces for use as a striking force in a counterattack.
- **Area Defense:** The defender concentrates on denying enemy forces access to designated terrain for a specific time, limiting their freedom of maneuver and channeling them into killing areas.
- **Retrograde:** Involves organized movement away from the enemy

### 3.3.3 Stability Operations:

Stability operations encompass various military missions, tasks, and activities conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief<sup>3</sup>. Stability operations can be conducted in support of a host-nation or interim government or as part of an occupation when no government exists. Stability operations involve both coercive and constructive military actions. The Primary Tasks for Stability operations consist of the following:

- **Civil Security:** Involves protecting the populace from external and internal threats
- **Civil Control:** Regulates selected behavior and activities of individuals and groups
- **Restore Essential Services:** Forces establish or restore basic services and protect them until a civil authority or the host nation can provide them.
- **Support to governance:** Establishing security and control, provide a foundation for transitioning authority to civilian agencies and eventually to host nation.
- **Support to economic and infrastructure development:** Support to economic and infrastructure development helps a host nation develop capability and capacity in these areas.

## 4. Mission Profile

Mission Profile (MP) describes the details of each specific mission by identifying sequentially the tasks, events, duration, and operating conditions of the system for each action within the mission. The following describes the JLTV FoV operational mode summary mission profiles for a MCO and IrW. Both scenarios incorporate the elements of the full spectrum of operation. MCO and IrW data was developed with information from a war gaming exercise conducted by the Maneuver Battle Lab (MBL), Virtual & Constructive Simulations Division Knox (VCSD-K) using DOD approved scenarios<sup>4</sup>. The war game was conducted using an enhanced Computer Aided Map Exercise (CAMEX) methodology with a Marine Expeditionary Force (MEF) and an Army Heavy Brigade Combat Team (HBCT) reinforced with an Infantry Battalion from an Infantry Brigade Combat Team (IBCT). For more on the CAMEX see the Fort Knox Maneuver Battle Lab, final report "Joint Light Tactical Vehicle (JLTV) Computer Aided Map Exercise (CAMEX)", dated 6 April 2009

Two strategic Defense Planning Guidance compliant scenarios, both set in 2017, were used during the Exercise. The first was a MCO scenario in Southwest Asia, designated SWA 10 by the Army Training and Doctrine Command (TRADOC). The second was a Stability Operations or IrW scenario based in Africa, known as Africa 1.0. Both Army and Marine player teams employed these scenarios as part of a larger joint force, although they each operated in different areas of operations within each scenario.

### 4.1. Major Combat Operations (MCO)

Major Combat Operations involve offensive maneuver against a defending enemy over large distances in relatively short periods of time, as well as defensive operations extended in time and space. Army offensive operations involve movements to positions of advantage via air or land, while Marine offensive operations involve amphibious assault as well as maneuver ashore. MCO occurs over varied terrain, from mountainous to open, desert to urban. Table 1 summarizes the results of the MCO scenario relevant to this OMS/MP.

<sup>3</sup> Field Manual No. 3-07, Stability Operations Headquarters Department of the Army Washington, DC, OCTOBER 2008

<sup>4</sup> Joint Light Tactical Vehicle (JLTV) Computer Aided Map Exercise (CAMEX) Final Report, 6 April 2009.

Table 1 - Marine Corps and Army Joint Major Combat Operation (MCO) Scenario with Mission Tasks *								
Operational Mode Summary (OMS)	Mission Profiles (MP)							Total
	Offense			Defense		Stability		
Full Spectrum Element MCO War Game Phases	Littoral/Air Assult	Movement to contact	Attack	Pursuit	Area Defense	Mobile Defense	Civil Security	
Duration (hours)	5.7	11.4	18.1	5.7	10.9	9.1	11.1	72
Distance (miles)	4.6	128.9	18.5	32.5	19.2	17.5	14.7	236
<b>Engine Operations (hours)</b>								
Dynamic Operation or Movement Time	0.9	6.4	4.2	1.4	1.8	2.0	2.5	19.1
Static Operation or Idle Time	1.2	1.6	2.9	0.7	1.6	1.4	1.7	11.1
Total Operating Time (Dynamic + Static)	2.1	8.0	7.1	2.1	3.4	3.4	4.2	30.3
Systems & Engine Off Time	1.8	3.4	8.2	2.8	6.2	4.5	6.2	33.1
<b>Auxiliary Power or Battery Power (hours)</b>								
Silent Watch Operating Time	1.8	0.0	2.8	0.8	1.3	1.2	0.7	8.6
Exportable Power	2.1	8.0	7.1	2.1	3.4	3.4	4.2	30.3
<b>Cycles (Numbers)</b>								
Engine on/off Cycles	1	2	3	0	2	1	1	10

Table 1 – MCO Mission Scenario

## 4.2. Irregular Warfare Operations (IrW)

Irregular warfare is defined as an intermittently violent, protracted struggle among state and non-state actors for legitimacy and influence over the relevant populations. IrW favors indirect and asymmetric approaches to a conflict, though it may employ the full range of military and other capabilities, the focus is to erode an adversary’s power, influence, and will. IrW includes a broad spectrum of combined arms operations, including those typically associated with MCO, such as raids or deliberate attacks, to those typically associated with Stability Operations, such as checkpoints, convoy operations or infrastructure development. Table 2 summarizes the results of the IrW scenario relevant to this OMS/MP.

Table 2 - Marine Corps and Army Joint Irregular Warfare (IrW) Scenario with Mission Tasks *							
Operational Mode Summary (OMS)	Mission Profiles (MP)						Total
	Stability		Defense		Offense		
Full Spectrum Element IrW War Game Phases	Civil Security	Restore Services	Support Government	Mobile Defense	Area Defense	Attack	
Duration (hours)	117.6	16.8	6.7	10.1	11.8	5.0	168
Distance (miles)	111.5	38.0	20.3	25.3	43.1	15.2	253
<b>Engine Operations (hours)</b>							
Dynamic Operation or Movement Time	18.1	2.6	1.0	1.6	1.8	0.8	25.8
Static Operation or Idle Time	13.9	2.0	0.8	1.2	1.4	0.6	19.9
Total Operating Time (Dynamic + Static)	32.0	4.6	1.8	2.7	3.2	1.4	45.7
Systems & Engine Off Time	68.7	9.8	3.9	5.9	6.9	2.9	98.2
<b>Auxiliary Power or Battery Power (hours)</b>							
Silent Watch Operating Time	16.9	2.4	1.0	1.4	1.7	0.7	24.1
Exportable Power	32.0	4.6	1.8	2.7	3.2	1.4	45.7
<b>Cycles (Numbers)</b>							
Engine on/off Cycles	11	7	4	4	8	3	37

Table 2 – IrW Mission Scenario

## 4.3. Annual Mileage

The JLTV FoV will accumulate an average of 11,000 annual miles, including 200 days of combat operations. The annual mileage is accumulated during the year while conducting a mix of MCO and IrW scenarios, each MCO mission consisting of 236 miles and each IrW is 253 miles. This mileage mirrors existing annual usage data of the current light tactical fleet; the JLTV FoV expected mission mix is 40/60 ratio in days of MCO to IrW.

JLTV Annual Usage Data						
	MCO	IrW	Annual Msn	Annual Msn Days	Annual Msn Miles	Annual Msn Roundedup
Mission Duration Days	3	7				
Mission Distance Miles	236	253			242.7	250
Number of Missions	27	17	44			
Annual Mission Days	81	119		200		
Annual Mission Miles	6369	4310			10679	11000
Percent Days	40%	60%				

Table 3 – Annual Mission Values

#### 4.4. Mission Payload

The JLTV and its companion trailer were analyzed using the vehicle’s maximum payload capability and estimated average consumption of material during both the MCO and IrW scenarios. Table 3 describes the frequency at which the vehicle and companion trailer operate under various payload conditions.

Vehicle and Trailer Percent Payload for RAM Testing				
Payload On-Board the JLTV FOV	Payload On-Board Trailer			
	No Trailer	Empty Trailer	Half Loaded Trailer	Fully Loaded Trailer
Empty JLTV (CW + Crew - All Payload)	1%	2%	1%	5%
Half Loaded JLTV (GVW + Crew - 1/2 Payload)	35%	1%	8%	3%
Fully Loaded JLTV (GVW + Crew)	24%	2%	3%	15%

Table 4 – Vehicle and Trailer Payload Cases

Note:

Curb Weight (CW): Empty vehicle, full fuel, lubricants, coolant, basic issue item (BI), on vehicle maintenance (OVM) items, weapon mount, and inherent armor.

Gross Vehicle Weight (GVW): Curb weight plus payload and armor.

Gross Combined Vehicle Weight (GCVW): GVW plus the weight of the tower load.

#### 4.5. Mission Equipment

The JLTV FoV will integrate a wide variety of mission equipment, including weapons; C4I equipment; kits, sets, and outfits; and other mission-role specific equipment. For example, weapon systems will consume a basic daily combat load; integrated radios will be operated per their specifically designed profile. The JTLV shall consider the equipment’s specific mission profiles and operating modes for the purposes of determining duration, cycles, Size, Weight, Power, and Cooling (SWAP-C).

### 5. Terrain

The JLTV FoV operational terrain is classified into two overall categories: improved surfaces and unimproved surfaces. Improved surfaces are primary and secondary road ways with some type of all weather surfaces, man-made improvements, and subject to periodic maintenance. Improved surfaces range from paved, high speed

roads in excellent condition through rutted and potholed gravel roads. Unimproved surfaces are trails and cross-country “natural” surfaces with no manmade improvements, no maintenance, and subject to variances of weather. Unimproved terrains include, but are not limited to, deserts, grasslands, sand, swamps, forests, tropical jungles, mountains, shallow rivers, and salt water beaches. The JLTV FoV operational envelope requires the capability for extended, effective operation on all terrain surfaces, but particularly on unimproved surfaces, during all weather conditions both day and night with limited and poor visibility.

Terrain values							
Terrain		Average Speed	Wave Number Spectrum	RMS Roughness (Inches)	%	Distance Miles	
Improved Surfaces	Primary Surfaces	High Quality Paved Road	55 mph	$G_{xx}(n)=1.4 \times 10^{-8}(n)^{-2.5}$	0.1	5%	12.5
		Secondary Pavement	50 mph	$G_{xx}(n)=1.9 \times 10^{-7}(n)^{-2.5}$	0.2	8%	20
	Secondary Surfaces	Rough pavement Degraded	40 mph	$G_{xx}(n)=8.0 \times 10^{-7}(n)^{-2.5}$	0.3 – 0.5	9%	22.5
		MOUT *	25 mph	WNS Does Not Apply	N/A	8%	20
		Loose Surface	35 mph	$G_{xx}(n)=3.0 \times 10^{-5}(n)^{-2.0}$	0.6	18%	45
		Belgian Block	20 mph	$G_{xx}(n)=4.0 \times 10^{-6}(n)^{-1.4}$	0.3 – 0.6	2%	5
		Washboard & Potholes	30 mph	$G_{xx}(n)=4.0 \times 10^{-6}(n)^{-2.4}$	0.7 -1.2	10%	25
Un-Improved Surfaces	Trails	25 mph	$G_{xx}(n)=4.6 \times 10^{-4}(n)^{-1.9}$	1.0 -3.4	20%	50	
	Cross-Country	15 mph	$G_{xx}(n)=9.2 \times 10^{-4}(n)^{-2.1}$	1.5 – 4.8	20%	50	
						Total	250

\* Table 6 - MOUT Discrete Description

Table 5 – Terrain Values

## 5.1. Improved Surfaces:

### 5.1.1 Primary Surfaces:

Primary surfaces are high quality paved, and secondary pavement with Root Mean Square (RMS) values varying between 0.1 inches to 0.2 inches. They consist of two or more lanes, all weather, maintained hard surface (paved) roads with good driving visibility designed for heavy, high density traffic. These roads have lanes with a minimum width of nine feet (2.75 meters), road crown to 2 degrees and all bridges will support the JLTV FoV maximum GVW/GCW. Secondary pavement can include significantly degraded (potholes, alligator cracking, freeze/thaw breakup) concrete, macadam concrete or asphalt pavements.

Forces in third world countries will find there is no prevalence of paved surfaces and the paved surface that exist are of substandard quality. High quality pavements where the JLTV's can run safely at speed consist of 5% of primary roads. Secondary pavement which is more typical of 3rd world pavements makes up 8%.

### 5.1.2 Secondary Surfaces:

Secondary surfaces are primary roads with rough pavement, loose surface, loose surface with washboard and potholes, and Belgian block surfaces with RMS values varying between 0.3 inches to 1.2 inches. Third world

countries will have large networks of neglected secondary pavement and roads using gravel or similar material as wear surfaces.

Rough pavement is two lane roads with degraded shoulders, and marginal subgrades which produce long wavelength swells and additional degradation of the surface. Grades can vary from 0% up through 6%. Generally, washboard occurs in drier operational areas, whereas pothole gravel roads occur in wet operational areas. These roads are one or more lanes, all weather, occasionally maintained with varying surfaces (e.g., large rock, crushed rock, or gravel) intended for medium-weight, low-density traffic. Bridges on secondary or unimproved roads are typically unreliable in terms of their load bearing capacity, meaning that military traffic must reinforce them, cross with caution, or use available alternative crossing methods, such as fording. Grades can vary from 0% up through 15%. Rough degraded pavement accounts for 9% of secondary roads. Loose surface roads accounts for 18% of the secondary roads. Wash boarded and potholed surfaces makes up 10% due to weather and traffic deteriorating loose surfaces. Belgian Block makes up 2% of secondary roads.

The Military Operations within Urban Terrains (MOUT) combines extensive manmade structures with characteristics of the terrains types described above, but essentially characterized as a mix of improved surfaces and a variety of discrete obstacles. However, as conflicts within built-up areas escalate, collapsed buildings and other damaged structures produce rubble that increases terrain roughness. Sight distance is severely limited and intersections require blind 90 degree turns to narrow streets. Buildings or walls lining streets create channelized pathways which make rubble piles, vehicle carcasses, bomb craters, or defender created obstructions effective barriers requiring a capability to go over rather than around them. There is limited room for vehicle maneuvering to go around obstacles or avoid kill zones due to narrow streets and alleys. Damaged water systems can flood streets to create wet pavement, weaken pavement substructures, destroyed substandard pavement, rut unpaved roads, and produce mud. Relatively good pavement will deteriorate as it is subjected to repeated military combat and tactical wheeled vehicle traffic. The discrete descriptions of the MOUT terrain are detailed in Table 6. MOUT terrain accounts for 8% of secondary surfaces.

## 5.2. Unimproved Surfaces:

### 5.2.1 Trails:

Trails are one lane, unimproved, seldom maintained loose surface roads intended for low density traffic with RMS values varying between 1.0 inches and 3.4 inches. Typically trails have no defined road width, large obstacles (rubble, boulder, logs, and stumps), cross ditches, washouts, steep slopes, and no bridging/culverts. Naturally occurring grades can vary from 0% up through 40%.

MOUT Terrain Discrete Event Description			
Discrete events	Description	Average Speed	Occurrence per MOUT Cycle *
Street curbs and obstacles	Drive over 6 inch vertical curb	15	1
City debris	Climb over 2 ft rubble piles	10	1
City obstacles	Negotiate randomly spaced fix obstacles	10	1
Wet pavement	Drive through 1/8 in water covered surface	30	1/4
Torsional Event	Drive across 18 in deep by 24 in diameter mortar crators	10	1
Ditch Slope/River Bank	Maneuver a 40 percent 8 ft side slopes	5	1/2
Climb multiple vertical steps	Climb and decent 20 feet of 6 inch stairs	5	1/4

\* A MOUT cycle consists of 20 miles of mix of primary surfaces and the occurrence of discrete events.  
(1) Once every MOUT cycle, (1/2) every other cycle, (1/4) to once every fourth MOUT cycle)

Table 6 – MOUT Discrete Descriptions

### 5.2.2 Cross Country:

Cross country is terrain not subject to repeated traffic with RMS values varying between 1.5 inches and 4.8 inches. Cross-country terrain can consist of tank trails with crushed rock or having large exposed obstacles (rocks, boulders, etc), but there are no roads, routes, well-worn trails, or man-made improvements. This includes, but is not limited to, flat desert, marshes, vegetated plains, jungle, dense forest, mountains, and urban rubble. Naturally occurring grades can vary from 0% up through 60%.

## 6. Environmental Conditions

The JLTV is designed to be deployed worldwide and operate in all environmental conditions. Adversaries will continue to leverage the environment to achieve maximum advantage against JLTV forces. To defeat these enemies, JLTV units must be equipped to operate with tactical skills day and night under all weather, terrain, and climatic conditions. The JLTV forces are expected to operate in, or be exposed to, the climatic conditions of hot, basic, cold, and severe cold as defined in Army Regulations (AR) 70-38<sup>5</sup> and duty cycled as depicted below:

Operating Temperature		
Climate	Operating Climate Temperature	% Use
Basic	-25°F to 110°F	85%
Hot	up to 130°F	10%
Cold	down to -50°F	3%
Severe Cold	down to -60°F	2%

Table 7 – Operating Temperature

### 6.1. Unique Environmental Requirements

The operating environment listed in Table 7 with their corresponding unique terrain conditions provide additional detail the JLTV will encounter during world wide combat operations.

Operating Environments			
<u>MOUT</u>	<u>Littoral Landing</u>	<u>Cold Climate</u>	<u>Mountainous Terrain</u>
Street curbs and obstacles	Fording	Ice	Cross Down Trees
City debris	Live Sand Dunes	Snow	Wash Outs
Wet pavement	Sand Wash		Cross Ditches
Torsional Event	Sand		Up to 60 % Grades
Climb over defensive obstacles	Mud		Climb over rocks obstacles
Ditch Slope/Crater/River Bank	Rice Paddy		
Climb multiple vertical steps			

Table 8 – Environmental/Terrain Breakdown

<sup>5</sup> Army AR 70–38 - Research, Development, Test, And Evaluation Of Materiel For Extreme Climatic Conditions