

Attachment 0040

RAM Duty Cycle

10 February 2012

Distribution Statement A – Approved for Public Release; distribution unlimited

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Trailer, C4I, and Electrical Load Duty Cycle

1. Trailer

The current JLTV Operational Terrain V3 calls for the companion trailer to be pulled behind the vehicle 40% of the time. It was determined that the Trailer Payload Cycles provided in the Operational Terrain V3 would present schedule challenges for adding and removing payload. To simplify the payload scenarios, it was determined that the JLTV companion trailer would be pulled to worst case scenarios (empty or fully loaded). The test community noted a potential safety concern with operating an empty vehicle with a fully loaded trailer. See the table below for payload duty cycles for the JLTV vehicle and trailer.

Trailer Duty Cycle

JLTV Vehicle and Trailer Percent Payload for RAM Testing			
Payload On-Board the JLTV FOV	Payload On-Board the JLTV Trailer		
	No Trailer	Empty Trailer	Full Trailer
Empty JLTV (CW+Crew)	19%	6%	0%
Fully Loaded JLTV (GVW)	41%	5%	29%

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2. C4I Equipment

The T&E IPT in coordination with the test sites and the C4I IPT has identified benefits to equipping the RAM vehicles with GFE (C4I and weapons) to determine the systems impact upon the integration of GFE. The five main areas of GFE integration include: voice transfer, data transfer, GPS, and diagnostics/prognostics data, DSDU/CSDU, and weapons. In order to assess the durability of these systems, the GFE should be exercised while the vehicle is operating over the test courses. It should be noted that this GFE shall be powered at all times during RAM testing. Use of the equipment during RAM operations should follow the duty cycles identified in the table below.

= cycles per mission, unless otherwise noted (#H=hours; #M=minutes, P=powered)

NA = vehicle not equipped / cycling not required

GFE/Kit	ATC				YTC				Considerations
	UTL-3	UTL-6	GP-4	CCWC-3	HGC-4	UTL-2	UTL-5	GP-9	
SINCGARS (VRC-92/110)	5	5	5	5	5	5	5	5	Requires direct line of sight. Radio should be powered at all times. Send and receive no less than 5 voice communications while on the move every mission (250 miles) or one at the beginning and end of each test shift. Radio frequency should be varied via CSDU.
UHF SATCOM (VRC-103)	NA	NA	NA	NA	NA	NA	NA	5	Requires direct line of sight. Radio should be powered at all times. Send and receive no less than 5 voice communications while on the move every mission (250 miles) or once at the beginning and end of each test shift. Radio frequency should be varied via CSDU.
HF (VRC-104)	NA	NA	NA	NA	NA	NA	NA	5	Requires direct line of sight. Radio should be powered at all times. Send and receive no less than 5 voice communications while on the move every mission (250 miles) or once at the beginning and end of each test shift. Radio frequency should be varied via CSDU.
GB-GRAM	5	5	5	5	5	5	5	5	Equipment should be powered at all times during testing. Verify GPS coordinates utilizing FBCB2 GUI at least 5 times per mission (250 miles) or once at the beginning and end of each test shift.
GPS Antenna	5	5	5	5	5	5	5	5	Equipment should be powered at all times during testing. Verify GPS coordinates utilizing FBCB2 GUI at least 5 times per mission (250 miles) or once at the beginning and end of each test shift.
OSRVT	NA	NA	NA	NA	NA	NA	NA	P	OSRVT transceiver should be powered at all times during testing.
FBCB2 (JBC-P, JCR)	5	5	5	5	5	5	5	5	EPLRS should be powered at all times during testing. Send and receive at least 5 data message every mission (250 miles) or once at the beginning and end of each test shift using FBCB2 GUI.
DVE	5	5	5	5	5	5	5	5	DVE should be powered at all times during testing. Validate front visual enhancement camera(s) are working at least 5 times during each mission (250 miles) or once at the beginning and end of each test shift. Exercise motor mounts (pan & tilt camera) at least 5 times per mission or once at the beginning and end of each test shift.

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ITAS	NA	NA	NA	5	NA	NA	NA	NA	ITAS should be powered at all times during testing. The ITAS should be operated at least 5 times per mission (250 miles) or once at the beginning and end of each test shift.
DSDU	5	5	5	5	5	5	5	5	Validate vehicle functionality through the GUI to include onboard vehicle operating parameters (i.e. engine temp, fuel, etc.), vehicle height management system, CTIS, power management system, diagnostics, etc. for at least one minute, 5 times every mission (250 miles) or once at the beginning and end of each test shift.
CSDU	5	5	5	5	5	5	5	5	CSDU should be powered at all times during testing. Use to monitor status of GFE for at least one minute, 5 times every mission (250 miles) or once at the beginning and end of each test shift. Can be accomplished during operation of GFE required above.
ASDU	NA		NA	NA	NA	NA	NA	5	ASDU should be powered at all times during testing. Monitor communications with the OSRVT transceiver for at least one minute, 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Shot Detection	NA	NA	NA	NA	P	NA	NA	NA	Shot detection should be powered at all times during testing.
Crew- (DUKE or CVRJ2.1 v2)	NA	15M	NA	NA	15M	NA	NA	15M	Crew system should be powered at all times during RAM testing. Verify power draw through power management system via GUI. Crew should be set to attack/jamming mode for at least 15 minutes once every four missions (1,000 miles).
GPK (MCTAGS or TOW w/ Turret Drive)	NA	NA	NA	1H	1H	NA	NA	NA	Traverse GPK with weapons mounts for 1 hour every mission (250 miles). Traversing should be done both electrically (if applicable) for five cycles and manually for five cycles. Each cycle shall include full range clockwise and full range counter-clockwise, for a total of ten consecutive cycles or ten minutes every hour. GPK shall be loaded to simulate weapon (.50) and ammunition weights and locations.

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3. Electrical Loads during RAM Testing

Exercising the electrical loads on the vehicles during RAM testing is essential to ensure the vehicle is capable of providing electrical power requirements over an extended duty cycle as well as to identify any failure modes on the vehicle or electrical system while operating over varied terrains. The JLTV design accommodates both onboard power (DC) and export power (AC) but not simultaneously. For onboard power, the vehicle will operate hotel loads of approximately 5 KW at all times, depending on the condition of equipped systems (e.g., A/C). It is expected that the vehicle will absorb the ~5 KW of power and therefore, no load bank will be required for the ~5 KW hotel load. An additional 10 KW of DC onboard power is also required to operate mission essential equipment (e.g., GFE, shelters). External load banks will be required to absorb some of this power during RAM operations. See the below table for onboard DC power duty cycles. The vehicle must also be able provide 10 KW of AC export power if equipped with export power kit. Additional external load banks will be required to absorb this power during RAM operations. The vehicle does not need to provide both 10 kW of DC and 10 kW of AC power at the same time. When AC power is provided, the amount provided should be subtracted from the amount of DC power so that the total power provided is never more than 10 kW plus hotel load. The loading profile will be instrumented and programmed accordingly for each RAM vehicle by the Test Site personnel, per the below table. When an export power kit is provided, 50% of the time the Export Power kit must be on. When the Export power kit is on, the total OBVP Load in the table below should be split evenly between the Export Power Kit (AC power) and On-board power (DC Power).

% of Time	Hotel Load & GFE - DC	Total OBVP Load Including GFE (kW)
48%	Specific to Each Vehicle	5
48%	Specific to Each Vehicle	8
4%	Specific to Each Vehicle	10

- Total Load needs to include all powered GFE so that total Load does not exceed 10 kW.

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4. Duty Cycling During RAM Testing

Exercising the various closures and physical systems on the vehicles during RAM testing is essential to ensure the vehicle subsystems are durable over an extended duty cycle as well as identify any failure modes on the vehicle while operating over varied terrains. It is expected that the vehicle and its subsystems to fully function during any mission. See the below table for the duty cycles of various subsystems throughout the missions.

= cycles per mission, unless otherwise noted (#H=hours)

NA = vehicle not equipped / cycling not required

Sub-system	ATC				YTC				Considerations
	UTL-3	UTL-6	GP-4	CCWC-3	HGC-4	UTL-2	UTL-5	GP-9	
Rear Doors w/ Combat Locks	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Commander Door w/ Combat Locks	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Driver Door w/ Combat Locks	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Hood	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Bessel Door	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Windshield Wipers	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Keyboard Support Open/Close	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Monitor Supports Stored/Unstored	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Weapon Controls Stored/Unstored	5	5	5	5	5	5	5	5	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift.
Gunner Stand Stored/Unstored	5*	5*	5*	5	5	5*	5*	5*	Functionality should be exercised throughout the test day. If not used, equipment should be operated /cycled no less than 5 times every mission (250 miles) or once at the beginning and end of each test shift. *If so equipped with weapons mount