NATO STANDARD

AEP-4754

NATO GENERIC VEHICLE ARCHITECTURE (NGVA) FOR LAND SYSTEMS

VOLUME II: POWER INFRASTRUCTURE

Edition B Version 1
FEBRUARY 2023

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED ENGINEERING PUBLICATION

Published by the
NATO STANDARDIZATION OFFICE (NSO)

INTENTIONALLY BLANK

NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

3 February 2023

1. The enclosed Allied Engineering Publication AEP-4754, Volume II, Edition B, Version 1 NATO GENERIC VEHICLE ARCHITECTURE (NGVA) FOR LAND SYSTEMS VOLUME II: POWER INFRASTRUCTURE, which has been approved by the nations in the NATO Army Armaments Group (AC/225 NAAG), is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 4754.

2. AEP-4754, Volume II, Edition B, Version 1 is effective upon receipt and supersedes AEP-4754, Volume II, Edition A, Version 1, which shall be destroyed in accordance with the local procedure for the destruction of documents.

3. This NATO standardization document is issued by NATO. In case of reproduction, NATO is to be acknowledged. NATO does not charge any fee for its standardization documents at any stage, which are not intended to be sold. They can be retrieved from the NATO Standardization Document Database ((https://nso.nato.int/nso/) or through your national standardization authorities.

4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Major General, GRC (A)
Director, NATO Standardization Office

INTENTIONALLY BLANK

RESERVED FOR NATIONAL LETTER OF PROMULGATION

INTENTIONALLY BLANK

RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

INTENTIONALLY BLANK

RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]

Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.

INTENTIONALLY BLANK

TABLE OF CONTENTS

INTENTIONALLY BLANK

CHAPTER 1 INTRODUCTION

1.1. Purpose

The aim of the NGVA Standard AEP 4754 Volumes I through VII is to enable the member nations to realize the benefits of an open architecture approach to Land vehicle platform design and integration, especially in regard to the vehicle platform electronic data and power infrastructure and the associated safety and verification & validation process.

1.2. Application of the NGVA Standard

The NGVA Standard is to be applied to all future land vehicle platforms and vehicle platform sub-system, as well as current vehicle platform refurbishment and upgrade programs.

This NGVA Standard is applicable to land vehicle platforms, ranging from simple to complex implementations. The requirements for these implementations are determined by the functionality required of the vehicle platform as a whole system including all sub-systems, and not the automotive or power elements alone. The requirements address equipment to be fitted as part of the initial operating capability and equipment likely to be fitted throughout the life of the vehicle platform. These requirements are expressed in the national system requirements documents and/or the sub-system requirements documents for the individual vehicle platforms concerned.

1.3. Agreement

Ratifying nations agree that the NGVA Standard is to be applied to all future land vehicle platforms and vehicle platform sub-systems, as well as current vehicle platform refurbishment and upgrade programs. Nations may propose changes at any time to the NATO Standardization Office (NSO).

Germany will act as custodian to maintain Configuration Management (CM) and change management of this Standard and its associated AEP Volumes.

Ratifying nations have agreed that national orders, manuals and instructions implementing this Standard will include a reference to the AEP 4754 Volumes I through VII for purposes of identification.

The NGVA Standard and its associated Volumes I through VII shall be considered as the foundation standard for vehicle sub-system integration, and should any conflict arise between this and other extant NATO documentation, this document shall take precedence.

Deviations from the NGVA Standard shall be agreed by the relevant national procurement office.

1.4. Ratification, implementation, and reservations

Ratification, implementation and reservation details are available on request or through the NATO Standardization Office (NSO) (internet: http://nso.nato.int).

1.5. Feedback

Any comments concerning this publication should be directed to: NATO/NSO – Bvd Leopold III - 1110 Brussels - Belgium.

Proposals for changes and improvements of the NGVA Standard AEP 4754 volumes I through VII shall be sent to the NSO and then forwarded to the custodian who will collect them and will propose new editions of the NGVA Standard AEP 4754 Volumes I through VII.

The NGVA Standard Point-of-Contact as assigned by the NGVA Standard Custodian is BAAINBw K1.2, Ferdinand-Sauerbruch-Str.1, D-56073 Koblenz, Germany.

CHAPTER 2 DEVELOPMENT OF NGVA STANDARD

The NATO Generic Vehicle Architecture (NGVA) Standard was developed under the auspices of the Military Vehicle Association (MILVA).

MILVA is an association of government agencies and industries promoting Vehicle Electronics (Vetronics) in the military environment. MILVA provides an open forum to its members and publishes guidelines and standards on Vetronics issues. MILVA works in close co-operation with NATO through the Land Capability Group on Land Engagement of the NATO Army Armament Group (NAAG).

2.1. NGVA Standard Structure

Figure 1 below illustrates the Standard structure, the Volumes relationships and technical areas covered under each Volume.

NGVA Standard AEP 4754

Volume I:	NGVA Architecture Approach (Describes the NATO Generic Vehicle Architecture (NGVA) concept)
Volume II:	NGVA Power Infrastructure (Defines the design constraints on power interfaces which form the NGVA Power Infrastructure)
Volume III:	NGVA Data Infrastructure (Defines the design constraints on the electronic interfaces that form the NGVA Data Infrastructure)
Volume IV:	NGVA Crew Terminal Software Architecture (Defines the design guidelines and constraints for standardized “Crew Terminal Software Applications”)
Volume V:	NGVA Data Model (Describes the NATO GVA Data Model (NGVA DM) approach used to produce the NGVA DM, the delivery and change management processes and finally gives implementation and deployment guidance)
Volume VI:	NGVA Safety (Outlines the generic procedures to incorporate system safety related planning, development, implementation, commissioning and activities in systems engineering)

Volume VII:	NGVA Verification and Validation (Provides guidance for the verification and validation of NGVA systems regarding their conformity to the AEPs associated with this STANAG)

Figure 1: NGVA Standard AEP 4754

2.2. General Notes

2.2.1. Scope

NGVA is the approach taken by NATO and related industry to standardize the interfaces and protocols for military vehicle systems integration. The Vehicle Architecture (including data and power architectures) is considered as the fundamental enabler that can provide new capabilities on military platforms so as to improve overall effectiveness (including cost) and efficiency within the whole vehicle life cycle. The NGVA Standard does not include standard automotive electronics and automotive power related information.

2.2.2. Warning

National governments, like their contractors, are subject to laws of their respective countries regarding health and safety. Many NATO STANAGs and Standards set out processes and procedures that could be hazardous to health if adequate precautions are not taken. Adherence to those processes and procedures in no way absolves users from complying with their national legal requirements.

2.3. Normative References

The documents and publications shown in Table 1below are referred to in the text of this AEP Volume. Documents and publications are grouped and listed in alpha-numeric order:

1. EN3155-001	Aerospace series. Electrical contacts used in elements of connection. Technical Specification
2. EN3155-065	Aerospace series. Electrical contacts used in elements of connection. Contacts, electrical, male, type A, crimp, class S, size 8. Product standard
3. EN3155-083	Aerospace series. Electrical contacts used in elements of connection. Contact, electrical, female, type A, crimp, class S, size 8. Product standard
4. EN3645-001	Aerospace series - Connectors, electrical, circular, scoop-proof, triple start threaded coupling, operating temperature 175 °C or 200 °C continuous. Technical specification
5. EN3645-002	Aerospace series - Connectors, electrical, circular, scoop-proof, triple start threaded coupling, operating temperature 175 °C or 200 °C continuous. Specification of performance and contact arrangements

6. MIL-DTL-38999 Series III	CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, HIGH DENSITY, QUICK DISCONNECT (BAYONET, THREADED OR BREECH COUPLING), ENVIRONMENT RESISTANT WITH CRIMP REMOVABLE CONTACTS OR HERMETICALLY SEALED WITH FIXED, SOLDERABLE CONTACTS, GENERAL SPECIFICATION FOR
7. MIL-STD-1275	MIL-STD-1275, DEPARTMENT OF DEFENSE INTERFACE STANDARD: CHARACTERISTICS OF 28 VOLT DC ELECTRICAL SYSTEMS IN MILITARY VEHICLES. This standard covers the limits of transient voltage characteristics and steady state limits of the 28 volt (V) direct current (dc) electric power circuits of military vehicles.
8. MIL-STD-1560	INSERT ARRANGEMENTS FOR MIL-DTL-38999, MIL-DTL-27599, AND SAE-AS29600 SERIES A ELECTRICAL CIRCULAR CONNECTORS
9. QPL	US Defense Logistic Agency (DLA) Land and Maritime Qualified Product List
10. STANAG 4074	AUXILIARY POWER UNIT CONNECTIONS FOR STARTING TACTICAL LAND VEHICLES - AEP-4074
11. VG 95212	Lists of approved components (LZB)
12. VG 95234	Electrical connectors with bayonet coupling, pressure-water tight, up to 245 A
13. VG 95328	Electrical connectors and plug-and-socket devices - Connectors with bayonet coupling, up to 13 A

Table 1: Normative References

Reference in Standard AEP 4754 to any normative references refers to, in any Invitation to Tender (ITT) or contract, the edition and all amendments current at the date of such tender or contract, unless a specific edition is indicated. For some standards, the most recent editions shall always apply due to safety and national regulatory requirements.

In consideration of the above and as best practice, those setting the requirements shall be fully aware of the issue, amendment status and application of all normative references, particularly when forming part of an ITT or contract.

2.4. Conventions

For the purposes of all AEP Volumes all requirements are specifically detailed in tables with each requirement classified as in the paragraph2.5. Where an AEP Volume contains no specific requirement tables they should serve as implementation guidance until technical standardization requirements are developed and included.

2.5. Requirements Classifications

The following classifications are to be used for all NGVA related requirements.

2.5.1. Compulsory Requirement (CR)

The requirement needs to be implemented in order to conform to Standard AEP 4754 and to gain certification. Compulsory requirements are listed in the Requirements Tables inside the AEPs and marked as “CR”.

2.5.2. Optional Enhancement (OE)

Optional Enhancements do not need to be implemented in order to conform to Standard AEP 4754. However, if such a capability is present, it needs to be implemented according to the stated specification in order to be compliant. Optional Enhancements are listed in the Requirements Tables inside the AEPs and marked as “OE”.

2.6. Abbreviations

Abbreviations referred to in this AEP Volume are given in Annex A.

2.7. Terms and Definitions

2.7.1. NGVA Definitions

1. **Base Vehicle**: The basic vehicle structure and those systems needed to enable it to perform its automotive functions and mobility. Where fitted it also includes those systems needed to control turrets and other physical elements e.g. a mine plough.
2. **Base Vehicle Sub-System**: A system that forms part of the base vehicle
3. **Crew Terminal**: An electronic hardware device that is used for entering data into and presenting visual and audio data from the NGVA Data Infrastructure connected to the Base Vehicle and all its Mission Sub-Systems.
4. **Electronic Architecture**: The combination of the electronic based sub-systems and electronic infrastructure that supports the vehicle crew to undertake their operational tasks
5. **NATO Generic Vehicle Architecture (NGVA):** The term ‘NATO Generic Vehicle Architecture’ refers to the open, modular and scalable architectural approach applied to the design of vehicle platforms.
6. **Mission Sub-System**: Separable elements or collections of equipment or software added to a Vehicle Platform that provides operationally required capabilities over and above those delivered by the Base Vehicle.
7. **Modular**: A modular electronic architecture is designed in such a way as to allow the replacement or addition of mission sub-systems and upgrades as required without any undesirable emergent properties.
8. **NGVA Compliant:** NGVA Compliance applies to the whole Vehicle Platform and all added Mission Sub-System and means that the Electronic Architecture of the Vehicle Platform complies with the requirements defined in NGVA Standard AEP-4754.
9. **NGVA Data Infrastructure:** The physical cables and connectors that provide means of distributing data around a base vehicle. It also includes any enabling logical components and functions e.g. Core platform management software, interface software, transport protocols and message definitions.

10. **NGVA Power Infrastructure:** The physical cables, connectors and other components that provide the means of distributing and controlling electrical power around a Base Vehicle.
11. **NGVA Ready**: NGVA Ready applies at a sub-system level and means that sub-systems and components have been developed to a level where they can be efficiently integrated within a "NGVA Compliant" vehicle Electronic Architecture. This would mean passing an incremental process with two sequentially-related Compatibility levels:
    a. **Connectivity Compatibility**: Ensures that the (sub-) system can be physically connected to the NGVA Power and Data Infrastructure without any negative impacts to existing NGVA (sub-) systems. Physical power and network interfaces comply with the requirements of Power and Data Infrastructure AEPs.
    b. **Communication Compatibility**: Connectivity Readiness and data interfaces (DDS/PLEVID) with associated NGVA Data Model implementation that comply with the requirements of Data Model and Data Infrastructure AEPs.
12. **Operator:** Any person required to monitor and control vehicle sub-systems.
13. **Power Management:** The means of prioritizing and controlling the electrical power loads throughout the vehicle platform.
14. **Scalable**: The trait of a system in being able to scale in order to handle increased loads of work.
15. **System:** A combination, with defined boundaries, of elements that are used together in a defined operating environment to perform a given task or achieve a specific purpose. The elements may include personnel, procedures, materials, tools, products, facilities, services and/or data as appropriate.
16. **Vehicle Crew:** All personnel located in the vehicle platform with defined roles needed to fulfil the necessary operational functions.
17. **Vehicle Platform**: The platform for the Mission Sub-Systems, which comprises all Base Vehicle Sub-Systems, the NGVA Power and Data Infrastructure and all common sub-systems, such as; crew terminals, processing units and other common platform resources (e.g. sighting systems).

2.7.2. AEP Specific Definitions

1. **Auxiliary Electrical Power Device**: Auxiliary electrical power devices are all units that are able to provide auxiliary electrical power to the vehicle network. For example Diesel-Engine driven generators, Fuel Cells, Photovoltaic Cells.

CHAPTER 3 NGVA POWER INFRASTRUCTURE

3.1. Introduction

This AEP defines the power interfaces and requirements that form the NGVA Power Infrastructure, including the physical cable connectors and other components that provide the means of distributing and controlling electrical power throughout a vehicle platform through internal and external power supply or distribution. This will ensure that equipment compatible with the requirements defined in this section can be readily installed and used with minimal changes to the vehicle platform. NVGA power infrastructure shall ensure that the use of external and compliant electrical devices cannot compromise the vehicle power management. Use of non NGVA equipment is not defined in this AEP and could lead to malfunction or destruction of the system.

3.1.1. Coverage of the NGVA Power Infrastructure

The NGVA Power Infrastructure covers:

1. Voltage range up to nominal 28V DC electrical systems;
2. Power Interfaces and connectors;
3. Power Conditioning;
4. Power Management;
5. Power Advice;
6. Power Control.

There are already potential improvements that are identified but are not included in this version of the STANAG. The reason for this is that the identified potential improvements are not yet enough mature or not globally used to be part of a STANAG. Examples of this are:

1. DC Voltage requirements above nominal 28V (High Voltage Systems for future systems with higher power demand)
2. DC Voltage Power transmission over Ethernet
3. AC Voltage requirements

3.1.2. Simplified layout of NGVA Power Infrastructure

NGVA Interface Panels shall be used inside the Vehicle Platform for Mission Sub-Systems that are installed on the Vehicle Platform for dedicated missions or shall be installed to foresee growth potential for connecting future NGVA Ready sub-systems. The NGVA Interface Panels (see Figure 2) shall be available at suitable locations inside the Vehicle Platform. There may be multiple panels within a Vehicle Platform with varying connector points and types. These panels shall be equipped with the NGVA Power and Data Connectors specified. NGVA Ready sub-systems must use these panels to receive power and to exchange NGVA Data.

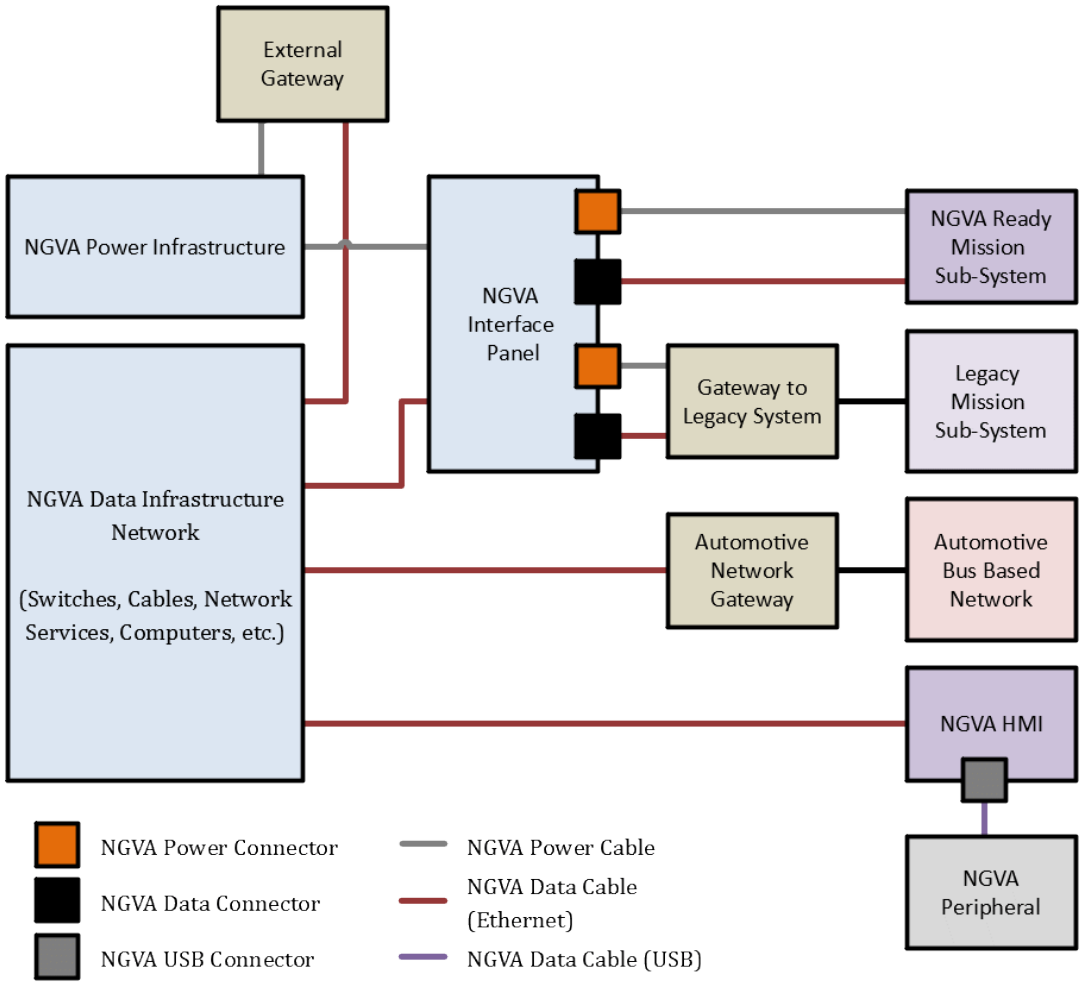


Figure 2: NGVA Interface Panel Concept for Networking of Sub-System

3.1.3. General Requirements relating to NGVA Power Infrastructure

Table 2 details the general requirements relating to the NGVA Power Infrastructure:

ID	Priority	Requirement Text
NGVA Power General		
NGVA_POW_001	CR	All vehicle platforms, vehicle platform sub-systems and equipments shall conform to the requirements contained within MIL-STD 1275.
NGVA_POW_002	OE	The power infrastructure shall only be accessible to additional equipment through NGVA compliant power outlets on an NGVA Interface Panel.
Auxiliary Power Outlets		
NGVA_POW_003	OE	The delivery of power to any power outlets shall be controllable by the crew.

Table 2: General Power Requirements

3.2. Architecture for electrical systems with 28V DC nominal voltage

3.2.1. General vehicle power architecture

Vehicles according to NGVA shall consist of Base Vehicle and Mission Sub-system.

Base vehicle equipment provides and distributes power to all electrical sensors, consumers and control units, which are necessary to operate the vehicle. This equipment will usually stay fitted during the vehicle lifetime. Base vehicle equipment does not need to comply with this AEP.

Base vehicle can provide functions for controlling power through automotive buses. These functions should be accessible through an appropriate interface as, for example, automotive gateway.

3.2.2. Hardwired information interchange

In order to provide system safety functionality on basic level, the low power connector is used to interchange information between different mission equipment and base vehicle equipment. For example: Emergency stop, Position of Hatches and interior black out lights Import and Export of electric power.

3.2.3. Power connections that are authorized

There may be system requirements for auxiliary power connections for electrical / electronic items of equipment that are not part of the integrated vehicle fit.

The use of auxiliary power connections to connect unauthorized and unapproved electrical and electronic devices has the potential to compromise the tested and verified vehicle EMC characteristics, affects vehicle sub-system performance (especially communications and ECM) and could potentially compromise the vehicle platform safety case.

3.2.4. General Vehicle Power Architecture Requirements

Table 3 details the general requirements relating to the general vehicle power architecture.

ID	Priority	Requirement Text
Isolated potential lines		
NGVA_POW_004	CR	Power system architecture shall provide an isolated two potential line supply (one positive and one negative) to all consumers, mission equipment and sensors.
NGVA_POW_005	CR	Mission Equipment not using the power system architecture shall not be connected to the vehicle chassis.
NGVA_POW_006	CR	Power supply returns through the vehicle structure shall not be used.

ID	Priority	Requirement Text
Back-up power supplies		
NGVA_POW_007	CR	If back-up power supplies within NGVA compliant connectors range is used, NGVA connectors is required. If back-up power supplies with currents over NGVA biggest connector is required, other connectors could be used.
NGVA_POW_008	CR	If power backup is connected on park plug, overload and short-circuit protection shall be placed in the wire as short as possible to the plug.
NGVA_POW_009	CR	Park plug shall be compliant with STANAG 4074

Table 3: General Vehicle Power Architecture Requirements

3.3. NGVA Power Interfaces and Connectors

3.3.1. Common Connectors

In order to ensure that there is a common standard for connecting sub-systems to the NGVA Power architecture, a set of common connectors have been defined. This will facilitate connection of equipment across NGVA compliant platforms.

For nations with demanding EMC requirements, the MIL-DTL connectors are recommended in preference to the German VG[1] type connectors. Every system that is compliant with NGVA shall use either MIL-DTL connectors or VG type connectors. There shall not be a mix of the two connector types.

It is recommended that the MIL-DTL connectors selected should be Qualified Product List (QPL)[2] listed.
It is recommended that the VG connectors selected should be listed in VG 95212"List of Approved Components" (LZB).

3.3.2. Current Rating of NGVA Power Outlets

This AEP specifies the current rating of the NGVA power outlets.

These power outlets defined hereafter are suitable for up to 28V DC nominal, which means they may be used on nominal 12V systems as well as nominal 24V systems.

If MIL-DTL/EN connectors are used:

Very Low Power: Nominal 28V DC/up to 15Amps: MIL-DTL-38999
Low Power: Nominal 28V DC/up to 25Amps: MIL-DTL-38999
Medium Power: Nominal 28V DC/up to 50Amps: MIL-DTL-38999
High Power: Nominal 28V DC/up to 90 Amps: EN3645

[1] German Military Standards VG-Norm
[2] US Defense Logistic Agency (DLA) Land and Maritime Qualified Product List

If VG connectors are used:

Very Low Power: Nominal 28V DC/up to 8 Amps: VG95328
Low Power: Nominal 28V DC/up to 13Amps: VG95328
High Power: Nominal 28V DC/up to 130 Amps: VG95234

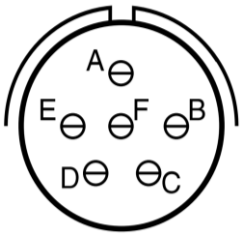
	MIL-DTL-38999 / EN3645	**VG 95234-5**	**VG 95328-5**	
8A	Not applicable	Not applicable	D 14-19 SN	Low power and hardwired signals
13A	Not applicable		M 14-19 PN	
15A	B98βN		Not applicable	
25A	C98βA		Not applicable	
50A	E06βN	Not applicable	Not applicable	Medium power
90A	G48βN	N1 32-1 βN	Not applicable	High power
130A	Not applicable	M 32-1 βN	Not applicable	

Table 4: Connector Definitions

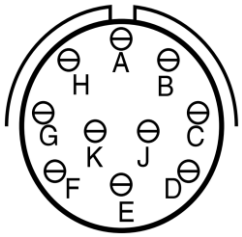
β=S or P for MIL-DTL-38999
β= F or M for EN3645

3.3.3. Pinout of NGVA Power Outlets

<table>
<tr><th>ID</th><th>Priority</th><th>Requirement Text</th></tr>
<tr><td>NGVA_POW_010</td><td>CR</td><td>When the receptacle or plug is providing power, socket contacts must be used (β=S).
When the receptacle or plug is receiving power, pin contacts must be used (β=P).</td></tr>
<tr><td colspan="3">28V Very Low power connectors</td></tr>
<tr><td>NGVA_POW_011</td><td>CR</td><td>The NGVA 28V DC 15 ampere very low power connector shall be of type MIL-DTL-38999 series III at its latest revision, D38999/XXαB98βN.

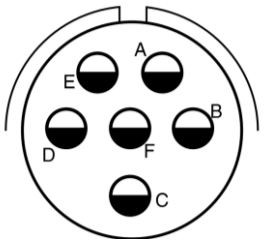
Shell style: XX depend on application
Plating: α (where α is not W, J or X)
Shell: B
Contact arrangement: 11-98
Contact type: β=S or P (socket or pin)
Keyway: N</td></tr>
<tr><td>NGVA_POW_012</td><td>CR</td><td>The pin-out for the NGVA MIL-DTL very low power connectors shall be:
<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>A</td><td>+28V DC</td></tr>
<tr><td>B</td><td>0</td></tr>
<tr><td>C</td><td>+28V DC</td></tr>
<tr><td>D</td><td>0</td></tr>
<tr><td>E</td><td>+28V DC</td></tr>
<tr><td>F</td><td>0</td></tr>
</table>

</td></tr>
</table>

<table>
<tr><th>ID</th><th>Priority</th><th>Requirement Text</th></tr>
<tr><td colspan="3">28V Low power connectors</td></tr>
<tr><td>NGVA_POW_013</td><td>CR</td><td>The NGVA 28V DC 25 ampere MIL-DTL low power connector shall be of type MIL-DTL-38999 series III at its latest revisionD38999/XXαC98 βA.

Shell style: XX depend on application
Plating: α (where α is not W, J or X)
Shell: C
Contact arrangement: 13-98
Contact type: β=S or P (socket or pin)
Keyway: A (the keyway is A instead of N to avoid confusion with MILCAN)</td></tr>
<tr><td>NGVA_POW_014</td><td>CR</td><td>The pin-out for the NGVA MIL-DTL low power connectors shall be:
<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>A</td><td>+28V DC</td></tr>
<tr><td>B</td><td>0</td></tr>
<tr><td>C</td><td>+28V DC</td></tr>
<tr><td>D</td><td>0</td></tr>
<tr><td>E</td><td>+28V DC</td></tr>
<tr><td>F</td><td>0</td></tr>
<tr><td>G</td><td>+28V DC</td></tr>
<tr><td>H</td><td>0</td></tr>
<tr><td>J</td><td>+28V DC</td></tr>
<tr><td>K</td><td>0</td></tr>
</table>

</td></tr>
<tr><td>NGVA_POW_015</td><td>CR</td><td>The NGVA 28V DC low power VG connectors shall be VG 95328 x 14-19 yN-J
x= Style, y= contact type; J=cadmium free surface</td></tr>
<tr><td>NGVA_POW_016</td><td>CR</td><td>The NGVA pin-out for the NGVA VG low power connectors shall be:
A: Emergency Stop;
C: Emergency Stop Return;
E: Blackout Lights On;
J:+28V DC;
K:+28V DC Return;
L: Ignition;
M: Remote Power Out</td></tr>
</table>

<table>
<tr><th>ID</th><th>Priority</th><th>Requirement Text</th></tr>
<tr><td colspan="3">28V Medium power connectors</td></tr>
<tr><td>NGVA_POW_017</td><td>CR</td><td>The NGVA 28V DC 50 ampere medium power connectors shall be of type MIL-DTL-38999 series III at its latest revision, D38999/XXαE06βN.

Shell style: XX depend on application
Plating: α (where α is not W, J or X)
Shell: E
Contact arrangement: 17-06
Contact type: β=S or P (socket or pin)
Keyway N</td></tr>
<tr><td>NGVA_POW_018</td><td>CR</td><td>The pin-out for the NGVA MIL-DTL medium power connectors shall be:

<table>
<tr><th>Pin</th><th>Function</th></tr>
<tr><td>A</td><td>+28V DC</td></tr>
<tr><td>B</td><td>0</td></tr>
<tr><td>C</td><td>+28V DC</td></tr>
<tr><td>D</td><td>0</td></tr>
<tr><td>E</td><td>+28V DC</td></tr>
<tr><td>F</td><td>0</td></tr>
</table>


</td></tr>
</table>

<table>
<tr><th>ID</th><th>Priority</th><th>Requirement Text</th></tr>
<tr><td colspan="3">28 V High power connectors</td></tr>
<tr><td>NGVA_POW_019</td><td>CR</td><td>The NGVA 28V DC high power 90A connector shall be of type EN3645 at its latest revision, EN3645 αXGN48βN

Plating: α (where α is not W or J, Cadmium plating is not allowed)
Shell style: X (plug or receptacle depends on application)
Shell size 21: G
Contact arrangement: 21-48
Contact type: β= F or M (socket or pin)
Keyway: N</td></tr>
<tr><td>NGVA_POW_020</td><td>CR</td><td>The pin-out for the NGVA highpower connectors shall be:

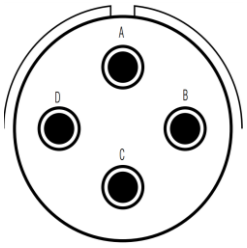
<table><tr><th>Pin</th><th>Function</th></tr><tr><td>A</td><td>+28V DC</td></tr><tr><td>B</td><td>0</td></tr><tr><td>C</td><td>+28V DC</td></tr><tr><td>D</td><td>0</td></tr></table>  </td></tr>
<tr><td>NGVA_POW_020</td><td>CR</td><td>The NGVA 28V DC high power 130 amp VG connectors shall be VG 95234 x 32-1 y N
x= Style, y= contact type; J=cadmium free surface</td></tr>
<tr><td>NGVA_POW_021</td><td>CR</td><td>The NGVA pin-out for the NGVA VG high power connectors shall be:
A: Remote Power In;
B:+28V DC;
E:+28V DC Return</td></tr>
</table>

Table 5: Power Distribution Interface Requirements

3.3.4. Circuit protection

ID	Priority	Requirement Text
NGVA_POW_022	CR	Each NGVA power outlet shall have appropriate circuit protection measures to prevent damage to connectors and cables

3.4. Power Conditioning

3.4.1. Conditioning Requirements

Power conditioning, either necessary for power supply units or consumers, will be necessary in order to fulfill the NGVA requirements.

3.4.2. Functional Power Requirements

There are some overarching requirements for the NGVA power architecture.

ID	Priority	Requirement Text
General Power requirements		
NGVA_POW_023	CR	The failure of a single NGVA power outlet or any connected equipment shall not cause a permanent loss of power at any other power outlet.

Table 6: General Power System Architecture Requirements

3.5. Power Management

In order to achieve effective power management a network enabled configurable power system should be designed for the vehicle.

3.5.1. Risk of vehicle battery failure

There is a risk if power is drawn from the vehicle batteries to power vehicle equipment that there will be insufficient battery power to start the engine. The vehicle crew needs to be aware when the platform and terminal equipment batteries are connected together and are drawing power.

3.5.2. Indication of the storage devices connection in the NGVA HMI

ID	Priority	Requirement Text
Battery Connection		
NGVA_POW_024	OE	The vehicle crew shall be provided with a visible indication if the base vehicle and mission equipment storage devices are connected together for power delivery.

Table 7: Storage devices Connection Requirements

3.6. Power Control

According to mission profile, it is essential to ensure that vehicle power is efficiently managed throughout a mission.

Power advice is defined as the potential to advise the vehicle crew on managing power loads based on a set of rules.

Power control is defined as the ability of the vehicle crew to switch loads from a distribution unit.

ID	Priority	Requirement Text
NGVA Power Management		
NGVA_POW_025	OE	The NGVA infrastructure shall be able to monitor power demands.
NGVA_POW_026	OE	A Battery group shall be dedicated to the Base Vehicle sub-system for preserving the ability to start the engine also when all the other vehicle batteries have been discharged
NGVA Power Advice		
NGVA_POW_027	OE	The crew shall be alerted to unsustainable power demand.
NGVA_POW_028	OE	The crew shall be provided with methods to control and manage the power demand.
NGVA_POW_029	OE	The NGVA power [sub-system] shall alert the [vehicle crew] to power fault conditions
NGVA_POW_030	OE	The NGVA power [sub-system] shall indicate to the [vehicle crew] the status of each power outlet including the instantaneous load (VA), switch status (On/Off), protection status
NGVA_POW_031	OE	The NGVA power [sub-system] shall inform the [vehicle crew] after an automatic protective action has been performed
NGVA Power Control		
NGVA_POW_032	OE	The NGVA Power Infrastructure shall provide controls to configure NGVA controlled power outlets to sub-systems to start in a set sequence, in order to allow initial inrush current management.
NGVA_POW_033	OE	The NGVA Power Infrastructure shall provide controls reset each vehicle platform power outlet after any protection trip.
NGVA_POW_034	OE	The NGVA Power Infrastructure shall provide controls to disable and derating NGVA power outlets when running on battery only
NGVA_POW_035	OE	The NGVA Power Infrastructure shall provide controls to manually override the NGVA power management and enable one or more default platform power configurations
NGVA_POW_036	OE	The NGVA Power Infrastructure shall provide controls to increase or advice crew to increase power generation, e.g. starting main engine with its generator, adapt engine RPM to electrical demand and battery SOC, start APU with its generator, or external power supply
NGVA_POW_037	OE	It shall be possible to manually isolate power to the mission equipment.
NGVA_POW_038	OE	Power distribution to a sub-system shall be able to be switched on and off.

ID	Priority	Requirement Text
NGVA Battery Monitoring		
NGVA_POW_039	OE	The NGVA Power [subsystem] shall monitor battery status for each battery group.
NGVA_POW_040	OE	The NGVA Power Battery Monitoring shall provide live data on battery status including : voltage level, state of charge %, time remaining in hours and minutes at the current load until engine restart can still be performed, state of health % and temperature for each battery group.
NGVA_POW_041	OE	The NGVA Power [subsystem] shall provide data on state of battery failure or battery monitoring failure for each battery group.
NGVA_POW_042	OE	The NGVA power [sub-system] shall be able to store various events and statistics: e.g. **Log statistics** • Statistic of Temperature (Vehicle ON / OFF) • Statistic of Alternator current • Statistic of SOC • Statistic of SOH • Statistic of U, I, Ri, T • Statistic of charge and discharge **Log events** • Number of engine start events (SOF) • Battery network interconnection • Total ON / OFF / trickle time • Number of Tow-start / bridge events • Min/Max temperature

Table 8: Power Conditioning and Control Requirements

INTENTIONALLY BLANK

ANNEX A ABBREVIATIONS

CR	Compulsory Requirement
COTS	Commercial Off The Shelf
DC	Direct Current
DDS	Data Distribution Service
DDSI	Data Distribution Service Interoperability
Def Stan	Defense Standard
ECM	Electronic Counter Measures
EMC	Electro-Magnetic Compatibility
GVA	Generic Vehicle Architecture
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
ISO	International Standards Organization
LAN	Local Area Network
MOTS	Military Off-The-Shelf
NATO	North Atlantic Treaty Organization
NGVA	NATO-Generic Vehicle Architecture
NGPOC	NGVA Point of Contact
NTA	Network Technical Authority
OE	Optional Enhancement
OMG	Object Management Group
PDT	Power Distribution Terminal
PE	Platform Equipment
RFC	Request for Comments
RFU	Reserved for Future Use
RoHS	Restriction of Hazardous Substances
SA	Situational Awareness
SAE	Society of Automotive Engineers
SRD	System Requirement Document
SS	System Specific
TE	Terminal Equipment
USB	Universal Serial Bus

AEP-4754 VOLII (B)(1)