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Military vehicle

Abstract

A military vehicle assembly includes a rear module. The rear module includes a rear frame assembly, a bed supported by the rear frame assembly, a rear tractive assembly, a transaxle supported by the rear frame assembly and coupled to the rear tractive assembly, and a rear suspension system including at least one component extending between a housing of the transaxle and the rear tractive assembly. The rear frame assembly has one or more upper interfaces and one or more lower interfaces. The one or more upper interfaces are configured to detachably couple to a rear end of a passenger capsule of a military vehicle. The one or more lower interfaces are configured to detachably coupled to a bottom of the passenger capsule. The transaxle is configured to couple to a prime mover and a front differential of the military vehicle.

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8139109	12/2011	Schmiedel et al.	N/A	N/A
8146477	12/2011	Joynt	N/A	N/A
8146478	12/2011	Joynt et al.	N/A	N/A
D661231	12/2011	Galante et al.	N/A	N/A
8205703	12/2011	Halliday	N/A	N/A
D662865	12/2011	Van Braeckel	N/A	N/A
8333390	12/2011	Linsmeier et al.	N/A	N/A
8347775	12/2012	Altenhof et al.	N/A	N/A
8376077	12/2012	Venton-Walters	N/A	N/A
8402878	12/2012	Schreiner et al.	N/A	N/A
8413567	12/2012	Luther et al.	N/A	N/A
8413568	12/2012	Kosheleff	N/A	N/A
8424443	12/2012	Gonzalez	N/A	N/A
8430196	12/2012	Halliday	N/A	N/A
D683675	12/2012	Munson et al.	N/A	N/A
8459619	12/2012	Trinh et al.	N/A	N/A
8465025	12/2012	Venton-Walters et al.	N/A	N/A
D686121	12/2012	McCabe et al.	N/A	N/A
8561735	12/2012	Morrow et al.	N/A	N/A
8578834	12/2012	Tunis et al.	N/A	N/A
8596183	12/2012	Coltrane	N/A	N/A
8596648	12/2012	Venton-Walters et al.	N/A	N/A
8601931	12/2012	Naroditsky et al.	N/A	N/A
8616617	12/2012	Sherbeck et al.	N/A	N/A
D698281	12/2013	Badstuebner et al.	N/A	N/A
8635776	12/2013	Newberry et al.	N/A	N/A
8667880	12/2013	Berman	N/A	N/A
D702615	12/2013	Conway et al.	N/A	N/A
D703119	12/2013	Platto et al.	N/A	N/A
8714592	12/2013	Thoreson et al.	N/A	N/A
8746741	12/2013	Gonzalez	N/A	N/A
8764029	12/2013	Venton-Walters et al.	N/A	N/A
8770086	12/2013	Enck	N/A	N/A
8801017	12/2013	Ellifson et al.	N/A	N/A
D714476	12/2013	Lai	N/A	N/A
8863884	12/2013	Jacob-Lloyd	N/A	N/A
8876133	12/2013	Ellifson	N/A	N/A
D718683	12/2013	Thole et al.	N/A	N/A
8905164	12/2013	Capouellez et al.	N/A	N/A
8921130	12/2013	Kundaliya et al.	N/A	N/A
8943946	12/2014	Richmond et al.	N/A	N/A
8944497	12/2014	Dryselius et al.	N/A	N/A
8947531	12/2014	Fischer et al.	N/A	N/A
8955859	12/2014	Richmond et al.	N/A	N/A
8960068	12/2014	Jacquemont et al.	N/A	N/A
D725555	12/2014	Wolff et al.	N/A	N/A
8967699	12/2014	Richmond et al.	N/A	N/A
8991834	12/2014	Venton-Walters et al.	N/A	N/A
8991840	12/2014	Zuleger et al.	N/A	N/A
9016703	12/2014	Rowe et al.	N/A	N/A
D728435	12/2014	Hanson et al.	N/A	N/A
9045014	12/2014	Verhoff et al.	N/A	N/A

D735625	12/2014	Mays et al.	N/A	N/A
D739317	12/2014	McMahan et al.	N/A	N/A
D740187	12/2014	Jamieson	N/A	N/A
9156507	12/2014	Reed	N/A	N/A
D742287	12/2014	Hanson et al.	N/A	N/A
D743308	12/2014	Hanson et al.	N/A	N/A
D743856	12/2014	Ma	N/A	N/A
9174686	12/2014	Oshkosh	N/A	N/A
D745986	12/2014	Gorsten Schuenemann et al.	N/A	N/A
9221496	12/2014	Barr et al.	N/A	N/A
D749464	12/2015	Giolito	N/A	N/A
9291230	12/2015	Ellifson et al.	N/A	N/A
D754039	12/2015	Behmer et al.	N/A	N/A
9303715	12/2015	Oshkosh	N/A	N/A
9327576	12/2015	Ellifson	N/A	N/A
9328986	12/2015	Pennau et al.	N/A	N/A
9329000	12/2015	Richmond et al.	N/A	N/A
9358879	12/2015	Bennett	N/A	N/A
9366507	12/2015	Richmond et al.	N/A	N/A
D762148	12/2015	Platto et al.	N/A	N/A
9409471	12/2015	Hoppe et al.	N/A	N/A
9420203	12/2015	Broggi et al.	N/A	N/A
D765566	12/2015	Vena et al.	N/A	N/A
D768320	12/2015	Lai	N/A	N/A
D769160	12/2015	Platto et al.	N/A	N/A
D772768	12/2015	Chiang	N/A	N/A
9492695	12/2015	Betz et al.	N/A	N/A
D774994	12/2015	Alemany et al.	N/A	N/A
D775021	12/2015	Harriton et al.	N/A	N/A
D776003	12/2016	Lee et al.	N/A	N/A
D777220	12/2016	Powell	N/A	N/A
D777615	12/2016	Hanson et al.	N/A	N/A
D778217	12/2016	Ito et al.	N/A	N/A
D782711	12/2016	Dunshee et al.	N/A	N/A
D784219	12/2016	Jung	N/A	N/A
D787993	12/2016	McCabe et al.	N/A	N/A
9650005	12/2016	Patelczyk et al.	N/A	N/A
9656640	12/2016	Verhoff et al.	N/A	N/A
D789840	12/2016	Curic et al.	N/A	N/A
D790409	12/2016	Baste	N/A	N/A
9688112	12/2016	Venton-Walters et al.	N/A	N/A
D791987	12/2016	Lin	N/A	N/A
9707869	12/2016	Messina et al.	N/A	N/A
D794853	12/2016	Lai	N/A	N/A
9738186	12/2016	Krueger et al.	N/A	N/A
D796715	12/2016	Lin	N/A	N/A
D797332	12/2016	Lin	N/A	N/A
D797603	12/2016	Noone et al.	N/A	N/A
D802491	12/2016	Mainville	N/A	N/A
D804065	12/2016	Lai	N/A	N/A
9809080	12/2016	Ellifson et al.	N/A	N/A
9829282	12/2016	Richmond et al.	N/A	N/A
D804372	12/2016	Kozub	N/A	N/A
D805965	12/2016	Davis	N/A	N/A
D805968	12/2016	Piscitelli et al.	N/A	N/A

D813757	12/2017	Kozub	N/A	N/A
D813758	12/2017	Gonzales	N/A	N/A
D815574	12/2017	Mainville	N/A	N/A
D818885	12/2017	Seo	N/A	N/A
D820179	12/2017	Kladde	N/A	N/A
D823182	12/2017	Yates	N/A	N/A
D823183	12/2017	Yates	N/A	N/A
D824294	12/2017	Ge et al.	N/A	N/A
10023243	12/2017	Hines et al.	N/A	N/A
10030737	12/2017	Dillman et al.	N/A	N/A
D824806	12/2017	Knox	N/A	N/A
D824811	12/2017	Mainville	N/A	N/A
D824814	12/2017	Heyde	N/A	N/A
D827410	12/2017	Earley	N/A	N/A
D828258	12/2017	Zipfel	N/A	N/A
D830242	12/2017	Zipfel	N/A	N/A
D837106	12/2018	Yang	N/A	N/A
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D839164	12/2018	Zipfel	N/A	N/A
10184553	12/2018	Kwiatkowski et al.	N/A	N/A
D842183	12/2018	Jackson et al.	N/A	N/A
D843281	12/2018	Gander et al.	N/A	N/A
D849283	12/2018	Lin	N/A	N/A
D850676	12/2018	Lin	N/A	N/A
D853285	12/2018	Yang	N/A	N/A
D853293	12/2018	Heroux et al.	N/A	N/A
D856860	12/2018	Gander	N/A	N/A
10369860	12/2018	Ellifson et al.	N/A	N/A
10392056	12/2018	Perron et al.	N/A	N/A
D859226	12/2018	Grooms	N/A	N/A
D860887	12/2018	Gander et al.	N/A	N/A
10421332	12/2018	Venton-Walters et al.	N/A	N/A
D862752	12/2018	Lai	N/A	N/A
D863144	12/2018	Gander	N/A	N/A
D864031	12/2018	Gander et al.	N/A	N/A
D864802	12/2018	Davis et al.	N/A	N/A
10434995	12/2018	Verhoff et al.	N/A	N/A
10435026	12/2018	Shively et al.	N/A	N/A
D865601	12/2018	Goodrich et al.	N/A	N/A
D867951	12/2018	Izard	N/A	N/A
D869332	12/2018	Gander et al.	N/A	N/A
D871283	12/2018	Gander et al.	N/A	N/A
10495419	12/2018	Krueger et al.	N/A	N/A
10609874	12/2019	Shumaker	N/A	N/A
10611203	12/2019	Rositch et al.	N/A	N/A
10611204	12/2019	Zhang et al.	N/A	N/A
10619696	12/2019	Dillman et al.	N/A	N/A
10632805	12/2019	Rositch et al.	N/A	N/A
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D885281	12/2019	Duncan et al.	N/A	N/A
D887050	12/2019	Lin	N/A	N/A
D888629	12/2019	Gander et al.	N/A	N/A
D891331	12/2019	Dickman et al.	N/A	N/A
D892002	12/2019	Gander	N/A	N/A
D893066	12/2019	Lin	N/A	N/A

D894063	12/2019	Dionisopoulos et al.	N/A	N/A
D894442	12/2019	Lin	N/A	N/A
10752075	12/2019	Shukla et al.	N/A	N/A
D897010	12/2019	Momokawa	N/A	N/A
10759251	12/2019	Zuleger	N/A	N/A
D898244	12/2019	Badstuebner et al.	N/A	N/A
D898632	12/2019	Gander	N/A	N/A
D899979	12/2019	Hamilton et al.	N/A	N/A
D900690	12/2019	Lovati	N/A	N/A
D902096	12/2019	Gander et al.	N/A	N/A
D902807	12/2019	Ruiz	N/A	N/A
D902809	12/2019	Hunwick	N/A	N/A
D904227	12/2019	Bracy	N/A	N/A
D904240	12/2019	Heilaneh et al.	N/A	N/A
D906902	12/2020	Duncan et al.	N/A	N/A
D908935	12/2020	Lin	N/A	N/A
D909639	12/2020	Chen	N/A	N/A
D909641	12/2020	Chen	N/A	N/A
D909644	12/2020	Chen	N/A	N/A
D909934	12/2020	Gander et al.	N/A	N/A
D910502	12/2020	Duncan et al.	N/A	N/A
10906396	12/2020	Schimke et al.	N/A	N/A
D911883	12/2020	Bae	N/A	N/A
D914562	12/2020	Kirkman et al.	N/A	N/A
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10981538	12/2020	Archer et al.	N/A	N/A
10987829	12/2020	Datema et al.	N/A	N/A
D919527	12/2020	Bender et al.	N/A	N/A
D922916	12/2020	Koo	N/A	N/A
D924740	12/2020	Zhao et al.	N/A	N/A
D925416	12/2020	Duncan et al.	N/A	N/A
D925421	12/2020	Mallicote et al.	N/A	N/A
D926093	12/2020	McMath	N/A	N/A
D926642	12/2020	Duncan et al.	N/A	N/A
D928672	12/2020	Gander et al.	N/A	N/A
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D930862	12/2020	Gander et al.	N/A	N/A
D932397	12/2020	Kaneko et al.	N/A	N/A
D933545	12/2020	Piaskowski et al.	N/A	N/A
D933547	12/2020	Hamilton et al.	N/A	N/A
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D934745	12/2020	Kentley-Klay et al.	N/A	N/A
D934766	12/2020	Duncan et al.	N/A	N/A
D935962	12/2020	Grand	N/A	N/A
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D936529	12/2020	Tang et al.	N/A	N/A
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D940605	12/2021	Sheffield et al.	N/A	N/A
D940607	12/2021	Park et al.	N/A	N/A
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D961478	12/2021	Hoste et al.	N/A	N/A
D966161	12/2021	Ruiz et al.	N/A	N/A
D980145	12/2022	Schwartz et al.	N/A	N/A
D1000652	12/2022	Wu	N/A	N/A
D1004510	12/2022	Bryant et al.	N/A	N/A
D1010520	12/2023	Bjerke	N/A	N/A
D1016683	12/2023	Heilaneh et al.	N/A	N/A
D1020557	12/2023	Lin	N/A	N/A
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D1022063	12/2023	Ye	N/A	N/A
D1025848	12/2023	Piaskowski et al.	N/A	N/A
D1027731	12/2023	Lee	N/A	N/A
D1029703	12/2023	Powell et al.	N/A	N/A
D1029705	12/2023	Gound	N/A	N/A
D1030557	12/2023	Willing et al.	N/A	N/A
D1031105	12/2023	Wu	N/A	N/A
D1032414	12/2023	Ecuyer et al.	N/A	N/A
D1033282	12/2023	Kim et al.	N/A	N/A
D1034320	12/2023	Tsuchida et al.	N/A	N/A
D1034325	12/2023	Kaban et al.	N/A	N/A
D1034347	12/2023	Moffett	N/A	N/A
D1034839	12/2023	Ye	N/A	N/A
D1036321	12/2023	Duncan et al.	N/A	N/A
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D1037960	12/2023	Sicot	N/A	N/A
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D1040057	12/2023	George	N/A	N/A
D1040691	12/2023	Armigliato et al.	N/A	N/A
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D1042249	12/2023	Wu	N/A	N/A
D1042251	12/2023	Willing et al.	N/A	N/A
D1043472	12/2023	Wu	N/A	N/A
D1044612	12/2023	Wu	N/A	N/A
D1049949	12/2023	Montoya Bueloni et al.	N/A	N/A
D1049958	12/2023	Oh	N/A	N/A
D1055788	12/2023	Young et al.	N/A	N/A
D1059229	12/2024	Kobayashi	N/A	N/A
D1061966	12/2024	Wu	N/A	N/A
D1063727	12/2024	Wu	N/A	N/A
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2007/0158920	12/2006	Delaney	N/A	N/A
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Background/Summary

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS (1) This application is a continuation of U.S. patent application Ser. No. 17/718,535, filed Apr. 12, 2022, which is a continuation of U.S. patent application Ser. No. 17/398,581, filed Aug. 10, 2021, which is a continuation of U.S. patent application Ser. No. 16/529,508, filed Aug. 1, 2019, which is a continuation of U.S. patent application Ser. No. 15/599,174, filed May 18, 2017, which is a continuation of U.S. patent application Ser. No. 14/724,279, filed May 28, 2015, which is a continuation of U.S. patent application Ser. No. 13/841,686, filed Mar. 15, 2013, which claims the benefit of U.S. Provisional Patent Application No. 61/615,812, filed Mar. 26, 2012, all of which are incorporated herein by reference in their entireties.

BACKGROUND
(1) The present application relates to vehicles. In particular, the present application relates to the structural frame assembly of a military vehicle.
(2) A military vehicle may be used in a variety of applications and conditions. These vehicles generally include a number of vehicle systems or components (e.g., a cab or body, a drive train, etc.). The military vehicle may also include various features and systems as needed for the specific application of the vehicle (e.g., a hatch, a gun ring, an antenna, etc.). Proper functioning and arrangement of the vehicle systems or components is important for the proper functioning of the vehicle.
(3) Traditional military vehicles include a cab assembly coupled to a pair of frame rails that extend along the length of the vehicle. The drive train, engine, and other components of the vehicle are coupled to the frame rails. Such vehicles may be transported by securing lifting slings to the frame rails and applying a lifting force (e.g., with a crane, with a helicopter, etc.). As the frame rails are the primary structure of the vehicle, a lifting force applied to a rear portion and a front portion elevate the vehicle from a ground surface. In such a configuration, the components of the vehicle must be coupled to the structural frame rails thereby requiring sequential assembly.
SUMMARY
(4) One embodiment relates to a military vehicle assembly. The military vehicle assembly includes a rear module. The rear module includes a rear frame assembly, a bed supported by the rear frame assembly, a rear tractive assembly, a transaxle supported by the rear frame assembly and coupled to the rear tractive assembly, and a rear suspension system including at least one component extending between a housing of the transaxle and the rear tractive assembly. The rear frame assembly has one or more upper interfaces and one or more lower interfaces. The one or more upper interfaces are configured to detachably couple to a rear end of a passenger capsule of a military vehicle. The one or more lower interfaces are configured to detachably coupled to a bottom of the passenger capsule. The transaxle is configured to couple to a prime mover and a front differential of the military vehicle.
(5) Another embodiment relates to a military vehicle assembly. The military vehicle assembly includes a rear module. The rear module includes a rear frame assembly, a rear tractive assembly, a transaxle supported by the rear frame assembly and coupled to the rear tractive assembly, and a rear suspension system including at least one component extending between a housing of the transaxle and the rear tractive assembly. The rear frame assembly has one or more upper interfaces and one or more lower interfaces. The one or more upper interfaces are configured to detachably couple to a rear end of a passenger capsule of a military vehicle. The one or more lower interfaces are configured to detachably coupled to a bottom of the passenger capsule. The transaxle is configured to couple to a prime mover and a front differential of the military vehicle.
(6) Still another embodiment relates to a military vehicle assembly. The military vehicle assembly includes a rear module and a suspension control system. The rear module includes a rear frame assembly, a rear tractive assembly, a transaxle supported by the rear frame assembly, and a rear suspension system. The rear frame assembly has one or more upper interfaces and one or more lower interfaces. The one or more upper interfaces are configured to detachably couple to a rear end of a passenger capsule of a military vehicle. The one or more lower interfaces are configured to detachably coupled to a bottom of the passenger capsule. The

transaxle is coupled to the rear tractive assembly. The transaxle is configured to couple to a prime mover and a front differential of the military vehicle. The rear suspension system includes a pair of gas springs and a pair of hydraulic dampers. The pair of hydraulic dampers are cross-plumbed to provide a hydraulic body roll control function. The suspension control system is configured to monitor a ride height of the military vehicle and control the pair of gas springs to adjust the ride height as load is added to or removed from the military vehicle.

(7) The invention is capable of other embodiments and of being carried out in various ways. Alternative exemplary embodiments relate to other features and combinations of features as may be recited in the claims.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The disclosure will become more fully understood from the following detailed description, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements, in which:

(2) FIGS. **1-2** are a perspective views of a vehicle, according to an exemplary embodiment.

(3) FIG. **3** is a schematic side view of the vehicle of FIG. **1**, according to an exemplary embodiment.

(4) FIGS. **4-6** are perspective views of a vehicle having a passenger capsule, a front module, and a rear module, according to an exemplary embodiment.

(5) FIGS. **7-9** are perspective views of a vehicle having a passenger capsule, a front module, and a rear module, according to an alternative embodiment.

(6) FIG. **10**A is a schematic sectional view of a vehicle having at least a portion of a suspension system coupled to a transaxle, according to an exemplary embodiment, and FIG. **10**B is schematic sectional view of a vehicle having a passenger capsule, according to an exemplary embodiment.

(7) FIG. **11** is schematic view of a braking system for a vehicle, according to an exemplary embodiment.

(8) FIG. **12** is schematic view of a vehicle control system, according to an exemplary embodiment.

DETAILED DESCRIPTION

(9) Before turning to the figures, which illustrate the exemplary embodiments in detail, it should be understood that the present application is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology is for the purpose of description only and should not be regarded as limiting.

(10) Referring to FIGS. **1-3**, a military vehicle **1000** includes a hull and frame assembly **100**, an armor assembly **200**, an engine **300**, a transmission **400**, a transaxle **450**, wheel and tire assemblies **600**, a braking system **700**, a fuel system **800**, and a suspension system **460** coupling the hull and frame assembly **100** to the wheel and tire assemblies **600**. According to an exemplary embodiment, the military vehicle **1000** includes a power generation system **900**. As shown in FIG. **1**, the military vehicle **1000** also includes a trailer **1100**.

(11) Hull and Frame Assembly

(12) Referring to FIG. **2**, the hull and frame assembly **100** includes a passenger capsule, shown as passenger capsule **110**, a front module, shown as front module **120**, and a rear module, shown as rear module **130**. According to an exemplary embodiment, the front module **120** and the rear module **130** are coupled to the passenger capsule **110** with a plurality of interfaces. As shown in FIG. **2**, the front module **120** includes a front axle having wheel and tire assemblies **600**.

(13) According to an exemplary embodiment, the rear module **130** includes a body assembly, shown as bed **132**. As shown in FIG. **2**, front module **120** also includes a body panel, shown as hood **122**. In some embodiments, the hood **122** partially surrounds the engine of military vehicle **1000**. The hood **122** is constructed of a composite material (e.g., carbon fiber, fiberglass, a combination of fiberglass and carbon fiber, etc.) and sculpted to maximize vision and clear under-hood components. According to an alternative embodiment, the hood **122** is manufactured from another material (e.g., steel, aluminum, etc.). The front portion of hood **122** mounts to a lower cooling package frame, and the upper mount rests on the windshield wiper cowl. This mounting configuration reduces the number and weight of components needed to mount the hood **122**. The Oshkosh Corporation® logo is mounted to a frame structure, which is itself mounted directly to the cooling package. The hood **122** includes bumperettes **123** that provide mounting locations for antennas (e.g., a forward-facing IED jammer, a communications whip antenna, etc.). In one embodiment, the bumperettes **123** and front of the hood **122** may be reinforced (e.g., with structural fibers, structural frame members, etc.) to become structural members intended to prevent damage to the tire assemblies **600**. In an

alternative embodiment, the bumperettes **123** may be crushable members or “break away” members that disengage upon impact to prevent interference between the bumperettes **123** and tire assemblies **600** in the event of a front impact.

(14) Referring next to the exemplary embodiment shown in FIGS. **4-9**, the military vehicle **1000** includes passenger capsule **110**, front module **120**, and rear module **130**. As shown in FIGS. **4** and **7**, passenger capsule **110** includes a structural shell **112** that forms a monocoque hull structure. Monocoque refers to a form of vehicle construction in which the vehicle body and chassis form a single unit. The structural shell **112** is configured to provide a structural load path between front module **120** and rear module **130** of military vehicle **1000** (e.g., during driving, a lifting operation, during a blast event, etc.). According to an exemplary embodiment, the structural shell **112** includes a plurality of integrated armor mounting points configured to engage a supplemental armor kit (e.g., a “B-Kit,” etc.). The structural shell **112** is rigidly connected to the rest of the powertrain, drivetrain, suspension, and major systems such that they all absorb blast energy during a blast event, according to an exemplary embodiment. According to an exemplary embodiment, the structural shell **112** is large enough to contain four-passengers in a standard two-by-two seating arrangement and four doors **104** are rotatably mounted to the structural shell **112**. According to the alternative embodiment shown in FIGS. **7-9**, two doors **104** are coupled to structural shell **112**. Front module **120** and rear module **130** are configured to engage a passenger capsule having either two doors or four doors, according to an exemplary embodiment. As shown in FIGS. **6** and **9**, the structural shell **112** includes a first end **114** and a second end **116**.

(15) According to an exemplary embodiment, front module **120** includes a subframe having a first longitudinal frame member **124** and a second longitudinal frame member **126**. As shown in FIGS. **4-9**, an underbody support structure **128** is coupled to the first longitudinal frame member **124** and the second longitudinal frame member **126**. According to an exemplary embodiment, the first longitudinal frame member **124** and the second longitudinal frame member **126** extend within a common plane (e.g., a plane parallel to a ground surface). The underbody support structure **128** is coupled to the first end **114** of structural shell **112** and includes a plurality of apertures **129** that form tie down points. In some embodiments, an engine for the military vehicle **1000** is coupled to the first longitudinal frame member **124** and the second longitudinal frame member **126**. In other embodiments, the front module **120** includes a front axle assembly coupled to the first longitudinal frame member **124** and the second longitudinal frame member **126**.

(16) As shown in FIGS. **4** and **6**, rear module **130** includes a subframe having a first longitudinal frame member **134** and a second longitudinal frame member **136**. As shown in FIGS. **4-9**, an underbody support structure **138** is coupled to the first longitudinal frame member **134** and the second longitudinal frame member **136**. According to an exemplary embodiment, the first longitudinal frame member **134** and the second longitudinal frame member **136** extend within a common plane (e.g., a plane parallel to a ground surface). The underbody support structure **138** is coupled to the second end **116** of structural shell **112**, the first longitudinal frame member **134**, and the second longitudinal frame member **136**. According to an exemplary embodiment, the first longitudinal frame member **134** and the second longitudinal frame member **136** include a plurality of apertures **139** that form tie down points. In some embodiments, a transaxle **450** or a differential for the military vehicle **1000** is coupled to at least one of the first longitudinal frame member **134** and the second longitudinal frame member **136**. In other embodiments, the rear module **130** includes a rear axle assembly coupled to the first longitudinal frame member **134** and the second longitudinal frame member **136**.

(17) The subframes of the front module **120** and the rear module **130** may be manufactured from High Strength Steels (HSS), high strength aluminum, or another suitable material. According to an exemplary embodiment, the subframes feature a tabbed, laser cut, bent and welded design. In other embodiments, the subframes may be manufactured from tubular members to form a space frame. The subframe may also include forged, rather than fabricated or cast frame sections to mitigate the stress, strains, and impact loading imparted during operation of military vehicle **1000**. Aluminum castings may be used for various cross member components where the loading is compatible with material properties. Low cost aluminum extrusions may be used to tie and box structures together.

(18) The structural shell **112** and the subframes of the front module **120** and the rear module **130** are integrated into the hull and frame assembly **100** to efficiently carry chassis loading imparted during operation of the military vehicle **1000**, during a lift event, during a blast event, or under still other conditions. During a blast event, conventional frame rails can capture the blast force transferring it into the vehicle. Military vehicle **1000** replaces conventional frame rails and instead includes passenger capsule **110**, front module

120, and rear module **130**. The passenger capsule **110**, front module **120**, and rear module **130** provides a vent for the blast gases (e.g., traveling upward after the tire triggers an IED) thereby reducing the blast force on the structural shell **112** and the occupants within passenger capsule **110**. Traditional frame rails may also directly impact (i.e. contact, engage, hit, etc.) the floor of traditional military vehicles. Military vehicle **1000** that includes passenger capsule **110**, front module **120**, and rear module **130** does not include traditional frame rails extending along the vehicle's length thereby eliminating the ability for such frame rails to impact the floor of the passenger compartment. Military vehicle **1000** that includes a passenger capsule **110**, front module **120**, and rear module **130** also has an improved strength-to-weight performance, abuse tolerance, and life-cycle durability.
(19) According to an exemplary embodiment, the doors **104** incorporate a combat lock mechanism. In some embodiments, the combat lock mechanism is controlled through the same handle that operates the automotive door latch system, allowing a passenger to release the combat locks and automotive latches in a single motion for quick egress. The doors **104** also interface with an interlocking door frame **109** defined within structural shell **112** adjacent to the latch, which helps to keep the doors **104** closed and in place during a blast even. Such an arrangement also distributes blast forces between a front and a rear door mounting and latching mechanism thereby improving door functionality after a blast event.
(20) Lift Structure
(21) According to an exemplary embodiment, the military vehicle **1000** may be transported from one location to another in an elevated position with respect to a ground surface (e.g., during a helicopter lift operation, for loading onto or off a ship, etc.). As shown in FIGS. **4-9**, military vehicle **1000** includes a lift structure **140** coupled to the front module **120**. According to an exemplary embodiment, the lift structure includes a first protrusion **144** extending from the first longitudinal frame member **124**, a second protrusion **146** coupled to the second longitudinal frame member **126**, and a lateral frame member **148** extending between the first protrusion **144** and the second protrusion **146**. As shown in FIGS. **4-9**, the first protrusion **144** and the second protrusion **146** extend along an axis that is generally orthogonal (e.g., within 20 degrees of an orthogonal line) to a common plane within which the first longitudinal frame member **134** and the second longitudinal frame member **126** extend. As shown in FIGS. **5-6** and **8-9**, the first protrusion **144** defines a first aperture **145**, and the second protrusion **146** defines a second aperture **147**. The first aperture **145** and the second aperture **147** define a pair of front lift points. An operator may engage the front lift points with a sling, cable, or other device to elevate military vehicle **1000** from a ground surface (e.g., for transport).
(22) According to an exemplary embodiment, the hood **122** defines an outer surface (e.g., the surface exposed to a surrounding environment) and an inner surface (e.g., the surface facing the first longitudinal frame member **124** and the second longitudinal frame member **126**). It should be understood that the outer surface is separated from the inner surface by a thickness of the hood **122**. As shown schematically in FIGS. **4**, **6-7**, and **9**, first protrusion **144** and second protrusion **146** extend through a first opening and a second opening defined within the hood **122**. According to an exemplary embodiment, the pair of front lift points is positioned along the outer surface of the hood **122** (e.g., to provide preferred sling angles, to facilitate operator access, etc.).
(23) According to an exemplary embodiment, the first longitudinal frame member **124** and the second longitudinal frame member **126** are coupled to the first end **114** of the structural shell **112** with a plurality of interfaces. Such interfaces may include, by way of example, a plurality of fasteners (e.g., bolts, rivets, etc.) extending through corresponding pads coupled to the front module **120** and the structural shell **112**. According to an exemplary embodiment, a lifting force applied to the pair of front lift points is transmitted into the structural shell of the passenger capsule to lift the vehicle.
(24) In some embodiments, the military vehicle **1000** includes breakaway sections designed to absorb blast energy and separate from the remaining components of military vehicle **1000**. The blast energy is partially converted into kinetic energy as the breakaway sections travel from the remainder of military vehicle **1000** thereby reducing the total energy transferred to the passengers of military vehicle **1000**. According to an exemplary embodiment, at least one of the front module **120** and the rear module **130** are breakaway sections. Such a military vehicle **1000** includes a plurality of interfaces coupling the front module **120** and the rear module **130** to passenger capsule **110** that are designed to strategically fail during a blast event. By way of example, at least one of the plurality of interfaces may include a bolted connection having a specified number of bolts that are sized and positioned (e.g., five 0.5 inch bolts arranged in a pentagon, etc.) to fail as an impulse force is imparted on front module **120** or rear module **130** during a blast event. In other

embodiments, other components of the military vehicle **1000** (e.g., wheel, tire, engine, etc.) are breakaway sections.

(25) Referring again to the exemplary embodiment shown in FIGS. **4-6**, the military vehicle **1000** may be lifted by a pair of apertures defined within a pair of protrusions **115**. The apertures define a pair of rear lift points for military vehicle **1000**. As shown in FIG. **5**, the pair of protrusions **115** extend from opposing lateral sides of the structural shell **112**. It should be understood that a lifting force applied directly to the pair of protrusions **115** may, along with the lifting force applied to lift structure **140**, elevate the military vehicle **1000** from a ground surface. The structural shell **112** carries the loading imparted by the lifting forces applied to the lift structure **140** (e.g., through the plurality of interfaces) and the pair of protrusions **115** to elevate the military vehicle **1000** from the ground surface without damaging the passenger capsule **110**, the front module **120**, or the rear module **130**.

(26) Armor Assembly

(27) Referring next to the exemplary embodiment shown in FIG. **10**B, the armor assembly **200** includes fabricated subassemblies (roof, floor, sidewalls, etc.) that are bolted together. The armor assembly **200** may be manufactured from steel or another material. The armor assembly **200** provides a robust and consistent level of protection by using overlaps to provide further protection at the door interfaces, component integration seams, and panel joints.

(28) In another embodiment, the armor assembly **200** further includes a 360-degree modular protection system that uses high hard steel, commercially available aluminum alloys, ceramic-based SMART armor, and two levels of underbody mine/improved explosive device (“IED”) protection. The modular protection system provides protection against kinetic energy projectiles and fragmentation produced by IEDs and overhead artillery fire. The modular protection system includes two levels of underbody protection. The two levels of underbody protection may be made of an aluminum alloy configured to provide an optimum combination of yield strength and material elongation. Each protection level uses an optimized thickness of this aluminum alloy to defeat underbody mine and IED threats.

(29) Referring now to FIG. **10**B, the armor assembly **200** also includes a passenger capsule assembly **202**. The passenger capsule assembly **202** includes a V-shaped belly deflector **203**, a wheel deflector, a floating floor, footpads **206** and energy absorbing seats **207**. The V-shaped belly deflector **203** is integrated into the sidewall. The V-shaped belly deflector **203** is configured to mitigate and spread blast forces along a belly. In addition, the wheel deflector mitigates and spreads blast forces. The “floating” floor utilizes isolators and standoffs to decouple forces experienced in a blast event from traveling on a direct load path to the passenger's lower limbs. The floating floor mounts to passenger capsule assembly **202** isolating the passenger's feet from direct contact with the blast forces on the belly. Moreover, footpads protect the passenger's feet. The energy absorbing seats **207** reduce shock forces to the occupants' hips and spine through a shock/spring attenuating system. The modular approach of the passenger capsule assembly **202** provides increased protection with the application of perimeter, roof and underbody add on panels. The components of the passenger capsule assembly **202** mitigate and attenuate blast effects, allow for upgrades, and facilitate maintenance and replacements.

(30) The passenger capsule assembly **202** further includes a structural tunnel **210**. For load purposes, the structural tunnel **210** replaces a frame or rail. The structural tunnel **210** has an arcuately shaped cross section and is positioned between the energy absorbing seats **207**. The configuration of the structural tunnel **210** increases the distance between the ground and the passenger compartment of passenger capsule assembly **202**. Therefore, the structural tunnel **210** provides greater blast protection from IEDs located on the ground because the IED has to travel a greater distance in order to penetrate the structural tunnel **210**.

(31) Engine

(32) The engine **300** is a commercially available internal combustion engine modified for use on military vehicle **1000**. The engine **300** includes a Variable Geometry Turbocharger (VGT) configured to reduce turbo lag and improve efficiency throughout the engine **300**'s operating range by varying compressor housing geometry to match airflow. The VGT also acts as an integrated exhaust brake system to increase engine braking capability. The VGT improves fuel efficiency at low and high speeds and reduces turbo lag for a quicker powertrain response.

(33) The engine **300** includes a glow plug module configured to improve the engine **300** cold start performance. In some embodiments, no ether starting aid or arctic heater is required. The glow plug module creates a significant system cost and weight reduction.

(34) In addition, engine **300** includes a custom oil sump pickup and windage tray, which ensures constant oil

supply to engine components. The integration of a front engine mount into a front differential gear box eliminates extra brackets, reduces weight, and improves packaging. Engine **300** may drive an alternator/generator, a hydraulic pump, a fan, an air compressor and/or an air conditioning pump. Engine **300** includes a top-mounted alternator/generator mount in an upper section of the engine compartment that allows for easy access to maintain the alternator/generator and forward compatibility to upgrade to a higher-power export power system. A cooling package assembly is provided to counteract extreme environmental conditions and load cases.

(35) According to an exemplary embodiment, the military vehicle **1000** also includes a front engine accessory drive (FEAD) that mounts engine accessories and transfers power from a front crankshaft dampener/pulley to the accessory components through a multiple belt drive system. According to an exemplary embodiment, the FEAD drives a fan, an alternator, an air conditioning pump, an air compressor, and a hydraulic pump. There are three individual belt groups driving these accessories to balance the operational loads on the belt as well as driving them at the required speeds. A top-mounted alternator provides increased access for service and upgradeability when switching to the export power kit (e.g., an alternator, a generator, etc.). The alternator is mounted to the front sub frame via tuned isolators, and driven through a constant velocity (CV) shaft coupled to a primary plate of the FEAD. This is driven on a primary belt loop, which is the most inboard belt to the crank dampener. No other components are driven on this loop. A secondary belt loop drives the hydraulic pump and drive through pulley. This loop has one dynamic tensioner and is the furthest outboard belt on the crankshaft dampener pulley. This belt loop drives power to a tertiary belt loop through the drive through pulley. The tertiary belt loop drives the air conditioning pump, air compressor, and fan clutch. There is a single dynamic tensioner on this loop, which is the furthest outboard loop of the system.

(36) Transmission, Transfer Case, Differentials

(37) Military vehicle **1000** includes a commercially available transmission **400**. Transmission **400** also includes a torque converter configured to improve efficiency and decrease heat loads. Lower transmission gear ratios combined with a low range of an integrated rear differential/transfer case provide optimal speed for slower speeds, while higher transmission gear ratios deliver convoy-speed fuel economy and speed on grade. In addition, a partial throttle shift performance may be refined and optimized in order to match the power outputs of the engine **300** and to ensure the availability of full power with minimal delay from operator input. This feature makes the military vehicle **1000** respond more like a high performance pickup truck than a heavy-duty armored military vehicle.

(38) The transmission **400** includes a driver selectable range selection. The transaxle **450** contains a differential lock that is air actuated and controlled by switches on driver's control panel. Indicator switches provide shift position feedback and add to the diagnostic capabilities of the vehicle. Internal mechanical disconnects within the transaxle **450** allow the vehicle to be either flat towed or front/rear lift and towed without removing the drive shafts. Mechanical air solenoid over-rides are easily accessible at the rear of the vehicle. Once actuated, no further vehicle preparation is needed. After the recovery operation is complete, the drive train is re-engaged by returning the air solenoid mechanical over-rides to the original positions.

(39) The transaxle **450** is designed to reduce the weight of the military vehicle **1000**. The weight of the transaxle **450** was minimized by integrating the transfercase and rear differential into a single unit, selecting an optimized gear configuration, and utilizing high strength structural aluminum housings. By integrating the transfercase and rear differential into transaxle **450** thereby forming a singular unit, the connecting drive shaft and end yokes traditionally utilized between to connect them has been eliminated. Further, since the transfercase and rear carrier have a common oil sump and lubrication system, the oil volume is minimized and a single service point is used. The gear configuration selected minimizes overall dimensions and mass providing a power dense design. The housings are cast from high strength structural aluminum alloys and are designed to support both the internal drive train loads as well as structural loads from the suspension system **460** and frame, eliminating the traditional cross member for added weight savings. According to the exemplary embodiment shown in FIG. **10**A, at least a portion of the suspension system **460** (e.g., the upper control arm **462**, the lower control arm **464**, both the upper and lower control arms **462**, **464**, a portion of the spring **466**, damper **468**, etc.) is coupled to the transaxle **450**. Such coupling facilitates assembly of military vehicle **1000** (e.g., allowing for independent assembly of the rear axle) and reduces the weight of military vehicle **1000**. The front axle gearbox also utilizes weight optimized gearing, aluminum housings, and acts as a structural component supporting internal drive train, structural, and engine loads as well. The integrated transfercase allows for a modular axle design, which provides axles that may be assembled and then mounted

to the military vehicle **1000** as a single unit. An integral neutral and front axle disconnect allows the military vehicle **1000** to be flat towed or front/rear lift and towed with minimal preparation. Further, the integrated design of the transaxle **450** reduces the overall weight of the military vehicle **1000**. The transaxle **450** further includes a disconnect capability that allows the front tire assemblies **600** to turn without rotating the entire transaxle **450**. Housings of the front and rear gearbox assembly are integrated structural components machined, for example, from high strength aluminum castings. Both front and rear gearbox housings provide stiffness and support for rear module **130** and the components of the suspension system **460**.

(40) Suspension

(41) The military vehicle **1000** includes a suspension system **460**. The suspension system **460** includes high-pressure nitrogen gas springs **466** calibrated to operate in tandem with standard low-risk hydraulic shock absorbers **468**, according to an exemplary embodiment. In one embodiment, the gas springs **466** include a rugged steel housing with aluminum end mounts and a steel rod. The gas springs **466** incorporate internal sensors to monitor a ride height of the military vehicle **1000** and provide feedback for a High Pressure Gas (HPG) suspension control system. The gas springs **466** and HPG suspension control system are completely sealed and require no nitrogen replenishment for general operation.

(42) The HPG suspension control system adjusts the suspension ride height when load is added to or removed from the military vehicle **1000**. The control system includes a high pressure, hydraulically-actuated gas diaphragm pump, a series of solenoid operated nitrogen gas distribution valves, a central nitrogen reservoir, a check valve arrangement and a multiplexed, integrated control and diagnostics system.

(43) The HPG suspension control system shuttles nitrogen between each individual gas spring and the central reservoir when the operator alters ride height. The HPG suspension control system targets both the proper suspension height, as well as the proper gas spring pressure to prevent “cross-jacking” of the suspension and ensure a nearly equal distribution of the load from side to side. The gas diaphragm pump compresses nitrogen gas. The gas diaphragm pump uses a lightweight aluminum housing and standard hydraulic spool valve, unlike more common larger iron cast industrial stationary systems not suitable for mobile applications.

(44) The suspension system **460** includes shock absorbers **468**. In addition to their typical damping function, the shock absorbers **468** have a unique cross-plumbed feature configured to provide auxiliary body roll control without the weight impact of a traditional anti-sway bar arrangement. The shock absorbers **468** may include an equal area damper, a position dependent damper, and/or a load dependent damper.

(45) Brakes

(46) The braking system **700** includes a brake rotor and a brake caliper. There is a rotor and caliper on each wheel end of the military vehicle **1000**, according to an exemplary embodiment. According to an exemplary embodiment, the brake system includes an air over hydraulic arrangement. As the operator presses the brake pedal, and thereby operates a treadle valve, the air system portion of the brakes is activated and applies air pressure to the hydraulic intensifiers. According to an exemplary embodiment, military vehicle **1000** includes four hydraulic intensifiers, one on each brake caliper. The intensifier is actuated by the air system of military vehicle **1000** and converts air pressure from onboard military vehicle **1000** into hydraulic pressure for the caliper of each wheel. The brake calipers are fully-integrated units configured to provide both service brake functionality and parking brake functionality.

(47) To reduce overall system cost and weight while increasing stopping capability and parking abilities, the brake calipers may incorporate a Spring Applied, Hydraulic Released (SAHR) parking function. The parking brake functionality of the caliper is created using the same frictional surface as the service brake, however the mechanism that creates the force is different. The calipers include springs that apply clamping force to the brake rotor to hold the military vehicle **1000** stationary (e.g. parking). In order to release the parking brakes, the braking system **700** applies a hydraulic force to compress the springs, which releases the clamping force. The hydraulic force to release the parking brakes comes through a secondary hydraulic circuit from the service brake hydraulic supply, and a switch on the dash actuates that force, similar to airbrake systems.

(48) Referring specifically to the exemplary embodiment shown in FIG. **11**, braking system **700** is shown schematically to include a motor **710** having a motor inlet **712**. The motor **710** is an air motor configured to be driven by an air system of military vehicle **1000**, according to an exemplary embodiment. The motor **710** may be coupled to the air system of military vehicle **1000** with a line **714**. As shown in FIG. **11**, braking system **700** includes a pump **720** that includes a pump inlet **722**, a pump outlet **724**, and a pump input shaft **726**. The pump input shaft **726** is rotatably coupled to the motor **710** (e.g., an output shaft of the motor **710**).

(49) As shown in FIG. **11**, braking system **700** includes a plurality of actuators **730** coupled to the pump

outlet **724**. According to an exemplary embodiment, the actuators **730** includes a housing **732** that defines an inner volume and a piston **734** slidably coupled to the housing **732** and separating the inner volume into a first chamber and a second chamber. The plurality of actuators **730** each include a resilient member (e.g., spring, air chamber, etc.), shown as resilient member **736** coupled to the housing and configured to generate a biasing force (e.g., due to compression of the resilient member **736**, etc.). According to an exemplary embodiment, the plurality of actuators **730** each also include a rod **738** extending through an end of the housing **732**. The rod **738** is coupled at a first end to piston **734** and coupled at a second end to a brake that engages a braking member (e.g., disk, drum, etc.), shown as braking member **740**. As shown in FIG. **11**, the rod is configured to apply the biasing force to the braking member **740** that is coupled to wheel and tire assemblies **600** thereby inhibiting movement of the military vehicle **1000**.
(50) According to an exemplary embodiment, a control is actuated by the operator, which opens a valve to provide air along the line **714**. Pressurized air (e.g., from the air system of military vehicle **1000**, etc.) drives motor **710**, which engages pump **720** to flow a working fluid (e.g., hydraulic fluid) a through line **750** that couples the pump outlet **724** to the plurality of actuators **730**. According to an exemplary embodiment, the pump **720** is a hydraulic pump and the actuator **730** is a hydraulic cylinder. Engagement of the pump **720** provides fluid flow through line **750** and into at least one of the first chamber and the second chamber of the plurality of actuators **730** to overcome the biasing force of resilient member **736** with a release force. The release force is related to the pressure of the fluid provided by pump **720** and the area of the piston **734**. Overcoming the biasing force releases the brake thereby allowing movement of military vehicle **1000**.
(51) As shown in FIG. **11**, braking system **700** includes a valve, shown as directional control valve **760**, positioned along the line **750**. According to an exemplary embodiment, directional control valve **760** includes a valve body **770**. The valve body **770** defines a first port **772**, a second port **774**, and a reservoir port **776**, according to an exemplary embodiment. When valve gate **762** is in the first position (e.g., pressurized air is not applied to air pilot **766**) valve gate **762** places first port **772** in fluid communication with reservoir port **776**. A reservoir **780** is coupled to the reservoir port **776** with a line **752**. The reservoir **780** is also coupled to the pump inlet **722** with a line **754**. It should be understood that the fluid may be forced into reservoir **780** from any number of a plurality of actuators **730** by resilient member **736** (e.g., when pump **720** is no longer engaged).
(52) According to an exemplary embodiment, the directional control valve **760** selectively couples the plurality of actuators **730** to the pump outlet **724** or reservoir **780**. The directional control valve **760** includes a valve gate **762** that is moveable between a first position and a second position. According to an exemplary embodiment, the valve gate **762** is at least one of a spool and a poppet. The valve gate **762** is biased into a first position by a valve resilient member **764**. According to an exemplary embodiment, the directional control valve **760** also includes an air pilot **766** positioned at a pilot end of the valve gate **762**. The air pilot **766** is coupled to line **714** with a pilot line **756**. Pressurized air is applied to line **714** drives motor **710** and is transmitted to air pilot **766** to overcome the biasing force of valve resilient member **764** and slide valve gate **762** into a second position. In the second position, valve gate **762** places first port **772** in fluid communication with **774** thereby allowing pressurized fluid from pump **720** to flow into actuators **730** to overcome the biasing force of resilient member **736** and allow uninhibited movement of military vehicle **1000**.
(53) Control System
(54) Referring to FIG. **12**, the systems of the military vehicle **1000** are controlled and monitored by a control system **1200**. The control system **1200** integrates and consolidates information from various vehicle subsystems and displays this information through a user interface **1201** so the operator/crew can monitor component effectiveness and control the overall system. For example, the subsystems of the military vehicle **1000** that can be controlled or monitored by the control system **1200** are the engine **300**, the transmission **400**, the transaxle **450**, the suspension system **460**, the wheels and tire assemblies **600**, the braking system **700**, the fuel system **800**, the power generation system **900**, and a trailer **1100**. However, the control system **1200** is not limited to controlling or monitoring the subsystems mentioned above. A distributed control architecture of the military vehicle **1000** enables the control system **1200** process.
(55) In one embodiment, the control system **1200** provides control for terrain and load settings. For example, the control system **1200** can automatically set driveline locks based on the terrain setting, and can adjust tire pressures to optimal pressures based on speed and load. The control system **1200** can also provide the status for the subsystems of the military vehicle **1000** through the user interface **1201**. In another example, the control system **1200** can also control the suspension system **460** to allow the operator to select appropriate

ride height.
(56) The control system **1200** may also provide in-depth monitoring and status. For example, the control system **1200** may indicate on-board power, output power details, energy status, generator status, battery health, and circuit protection. This allows the crew to conduct automated checks on the subsystems without manually taking levels or leaving the safety of the military vehicle **1000**.
(57) The control system **1200** may also diagnose problems with the subsystems and provide a first level of troubleshooting. Thus, troubleshooting can be initiated without the crew having to connect external tools or leave the safety of the military vehicle **1000**.
(58) The construction and arrangements of the vehicle, as shown in the various exemplary embodiments, are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter described herein. Some elements shown as integrally formed may be constructed of multiple parts or elements, the position of elements may be reversed or otherwise varied, and the nature or number of discrete elements or positions may be altered or varied. The order or sequence of any process, logical algorithm, or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions may also be made in the design, operating conditions and arrangement of the various exemplary embodiments without departing from the scope of the present invention.

Claims

1. A military vehicle assembly comprising: a rear module including: a rear frame assembly having one or more upper interfaces and one or more lower interfaces, the one or more upper interfaces configured to detachably couple to a rear end of a passenger capsule of a military vehicle, the one or more lower interfaces configured to detachably coupled to a bottom of the passenger capsule; a bed supported by the rear frame assembly; a rear tractive assembly; a transaxle supported by the rear frame assembly, the transaxle coupled to the rear tractive assembly, the transaxle configured to couple to a prime mover and a front differential of the military vehicle; and a rear suspension system including at least one component extending between a housing of the transaxle and the rear tractive assembly.
2. The military vehicle assembly of claim 1, wherein the rear suspension system includes a first spring, a second spring, a first damper, and a second damper, and wherein the at least one component includes at least one of (a) the first spring and the second spring or (b) the first damper and the second damper.
3. The military vehicle assembly of claim 2, wherein the at least one component includes the first spring and the second spring.
4. The military vehicle assembly of claim 2, wherein the at least one component includes the first damper and the second damper.
5. The military vehicle assembly of claim 2, wherein the at least one component includes the first spring, the second spring, the first damper, and the second damper.
6. The military vehicle assembly of claim 2, wherein the first spring and the second spring are high-pressure nitrogen springs, and wherein the first damper and the second damper are hydraulic dampers.
7. The military vehicle assembly of claim 1, wherein the rear suspension system includes a pair of gas springs, further comprising a suspension control system configured to: monitor a ride height of the military vehicle; and control the pair of gas springs to adjust the ride height as load is added to or removed from the military vehicle.
8. The military vehicle assembly of claim 7, wherein the pair of gas springs are high-pressure nitrogen springs.
9. The military vehicle assembly of claim 1, wherein the rear suspension system includes a pair of hydraulic dampers, wherein the pair of hydraulic dampers are cross-plumbed to provide a hydraulic body roll control function.
10. The military vehicle assembly of claim 1, wherein the transaxle includes an internal mechanical disconnect that facilitates decoupling the transaxle from the front differential.
11. The military vehicle assembly of claim 10, further comprising an actuator configured to facilitate manually engaging the internal mechanical disconnect.

12. The military vehicle assembly of claim 1, wherein the transaxle includes a transfercase component and a rear differential component at least partially contained within the housing.

13. The military vehicle assembly of claim 1, further comprising a front module including: a front frame assembly having one or more upper interfaces and one or more lower interfaces, the one or more upper interfaces configured to detachably couple to a front end of the passenger capsule, the one or more lower interfaces configured to detachably coupled to the bottom of the passenger capsule; a front tractive assembly; the prime mover; and the front differential coupled to the front tractive assembly.

14. The military vehicle assembly of claim 13, wherein the front module and the rear module are couplable to different variants of the passenger capsule to provide different variants of the military vehicle.

15. The military vehicle assembly of claim 14, wherein the different variants of the passenger capsule include a first variant defining four door openings and a second variant defining two door openings.

16. The military vehicle assembly of claim 13, wherein the prime mover includes an engine.

17. A military vehicle assembly comprising: a rear module including: a rear frame assembly having one or more upper interfaces and one or more lower interfaces, the one or more upper interfaces configured to detachably couple to a rear end of a passenger capsule of a military vehicle, the one or more lower interfaces configured to detachably coupled to a bottom of the passenger capsule; a rear tractive assembly; a transaxle supported by the rear frame assembly, the transaxle coupled to the rear tractive assembly, the transaxle configured to couple to a prime mover and a front differential of the military vehicle; and a rear suspension system including at least one component extending between a housing of the transaxle and the rear tractive assembly.

18. The military vehicle assembly of claim 17, wherein the rear suspension system includes a pair of gas springs and a pair of hydraulic dampers.

19. A military vehicle assembly comprising: a rear module including: a rear frame assembly having one or more upper interfaces and one or more lower interfaces, the one or more upper interfaces configured to detachably couple to a rear end of a passenger capsule of a military vehicle, the one or more lower interfaces configured to detachably coupled to a bottom of the passenger capsule; a rear tractive assembly; a transaxle supported by the rear frame assembly, the transaxle coupled to the rear tractive assembly, the transaxle configured to couple to a prime mover and a front differential of the military vehicle; and a rear suspension system including a pair of gas springs and a pair of hydraulic dampers, wherein the pair of hydraulic dampers are cross-plumbed to provide a hydraulic body roll control function; and a suspension control system configured to: monitor a ride height of the military vehicle; and control the pair of gas springs to adjust the ride height as load is added to or removed from the military vehicle.

20. The military vehicle assembly of claim 19, wherein at least one of (a) the pair of gas springs or (b) the pair of hydraulic dampers extend between a housing of the transaxle and the rear tractive assembly.