WHAT IS CLAIMED IS:

1. An engineered Ebolavirus glycoprotein (GP) protein, comprising (a) substitution of residue W615 in heptad repeat 2 (HR2) with residue L, A, V, I, or F, and (b) one or more proline substitutions in heptad repeat 1 C segment ($HR1_C$); wherein the amino acid numbering is based on *Zaire* Ebolavirus GP sequence with UniProt ID Q05320 (SEQ ID NO:1).

2. The engineered Ebolavirus GP protein of claim 1, wherein the Ebolavirus is *Zaire Ebolavirus* (EBOV), *Sudan virus* (SUDV), *Taï forest virus* (TAFV), *Bundibugyo virus* (BDBV), or *Reston Ebolavirus* (RESTV).

3. The engineered Ebolavirus GP protein of claim 1, wherein the proline substitutions comprise T577P or L579P.

4. The engineered Ebolavirus GP protein of claim 1, further comprising a truncation at the C-terminus of the membrane proximal external region (MPER).

5. The engineered Ebolavirus GP protein of claim 4, further comprising (a) a deletion of the mucin-like domain (MLD) deleted from the GP1 subunit, and/or (b) a deletion of MPER from the GP2 subunit.

6. An engineered Ebolavirus glycoprotein (GP) protein, comprising:
(a) a truncated soluble GP of an Ebolavirus that has the mucin-like domain (MLD) deleted from the GP1 subunit and the membrane proximal external region (MPER) deleted from the GP2 subunit, and
(b) substitution of residue W615 in heptad repeat 2 (HR2) with residue L, A, V, I or F; wherein the amino acid numbering is based on *Zaire* Ebolavirus GP sequence corresponding to UniProt ID Q05320 (SEQ ID NO:1).

7. The engineered Ebolavirus GP protein of claim 6, further comprising one or more modifications selected from (i) an extension of HR2 at the C terminus, (ii) one or more proline substitutions in heptad repeat 1 C segment ($HR1_C$), and (iii) one or more engineered inter-GP disulfide bonds.

8. The engineered Ebolavirus GP protein of claim 6, wherein the truncated soluble GP comprises SEQ ID NO:2 or SEQ ID NO:3, or a variant thereof with at least 99% sequence identity.

9. The engineered Ebolavirus GP protein of claim 6, comprising the sequence SEQ ID NO:4, or a variant thereof with at least 99% sequence identity.

10. The engineered Ebolavirus GP protein of claim 6, further comprising an extension of HR2 at the C-terminus.

11. The engineered Ebolavirus GP protein of claim 10, wherein the HR2 extension comprises (a) extending HR2 C terminus with a N-terminal fragment of the adjacent membrane proximal external region (MPER) of the Ebolavirus glycoprotein or (b) replacing a HR2 C-terminal fragment with a longer leucine zipper motif.

12. The engineered Ebolavirus GP protein of claim 10, wherein the HR2 extension comprises (a) extending the HR2 C terminus from residue 632 to residue 637 in MPER, (b) extending the HR2 C terminus from residue 632 to residues 643 in MPER, or (c) replacing residues 617-632 with a GCN4 leucine zipper sequence shown in SEQ ID NO:34.

13. The engineered Ebolavirus GP protein of claim 10, wherein the W615 substitution comprises W615L substitution or P612G/W615F double mutation.

14. The engineered Ebolavirus GP protein of claim 10, comprising (a) W615L substitution and (b) extension of the HR2 C terminus from residue 632 to residue 637 in MPER of the Ebolavirus GP.

15. The engineered Ebolavirus GP protein of claim 10, comprising (a) P612G/W615F double mutation in HR2 and (b) replacement of residues 617-632 with a GCN4 leucine zipper sequence shown in SEQ ID NO:34.

16. The engineered Ebolavirus GP protein of claim 10, comprising an amino acid sequence as set forth in any one of SEQ ID NOs:5-8, or a variant thereof with at least 99% sequence identity.

17. The engineered Ebolavirus GP protein of claim 10, further comprising a C-terminal trimerization motif.

18. The engineered Ebolavirus GP protein of claim 17, wherein the C-terminal trimerization motif comprises SEQ ID NO:29 or SEQ ID NO:30, or a variant thereof with at least 99% sequence identity.

19. The engineered Ebolavirus GP protein of claim 6, further comprising one or more proline substitutions in the $HR1_C$ segment.

20. The engineered Ebolavirus GP protein of claim 19, comprising an amino acid sequence as set forth in any one of SEQ ID NOs:9-17 and 20, or a variant thereof with at least 99% sequence identity.

21. The engineered Ebolavirus GP protein of claim 19, comprising (a) W615L substitution, (b) proline substitution T577P or L579P, and (c) HR2 extension from residue 632 to residue 637 in MPER.

22. The engineered Ebolavirus GP protein of claim 19, further comprising an extension of the HR2 C terminus.

23. The engineered Ebolavirus GP protein of claim 6, further comprising an engineered disulfide bond between two neighboring GP protomers.

24. The engineered Ebolavirus GP protein of claim 23, wherein the engineered disulfide bond is engineered between residues G91/A575 (SS2), F153/Y534 (SS1), T520/A575 (SS3), G157/I532 (SS4), D522/A575 (SS5) or K56/G599 (SS6).

25. A pharmaceutical composition, comprising the engineered Ebolavirus GP protein of claim 6, and a pharmaceutically acceptable carrier.

26. A vaccine composition, comprising an engineered Ebolavirus GP protein of claim 6 that is displayed on the surface of a self-assembling nanoparticle.

27. The vaccine composition of claim 26, comprising (1) a polypeptide sequence containing from N terminus to C terminus (a) the engineered Ebolavirus GP protein, linker sequence G_4S (SEQ ID NO:43), nanoparticle sequence ferritin, (b) the engineered Ebolavirus GP protein, linker sequence G_4S (SEQ ID NO:43), nanoparticle sequence E2p, or (c) the engineered Ebolavirus GP protein, linker sequence $(G_4S)_2$ (SEQ ID NO:42), nanoparticle sequence I3-01v9; wherein the engineered Ebolavirus GP protein comprises W615L substitution, proline substitution T577P, and HR2 extension from residue 632 to residue 637 in MPER.

28. The vaccine composition of claim 27, further comprising a locking domain and/or a T-cell epitope that is fused to the C-terminus of the nanoparticle subunit sequence.

29. The vaccine composition of claim 28, comprising (1) a polypeptide sequence containing from N-terminus to C-terminus (a) the engineered Ebolavirus GP protein shown in SEQ ID NO:17, nanoparticle subunit sequence shown in SEQ ID NO:36 (E2p), locking domain shown in SEQ ID NO:39 (LD4), and T cell epitope shown in SEQ ID NO:31 (PADRE) or (b) the engineered Ebolavirus GP protein shown in SEQ ID NO:17, nanoparticle sequence shown in SEQ ID NO:37 (I3-01v9), locking domain shown in SEQ ID NO:40 (LD7), or (2) a a variant of polypeptide sequence with at least 99% sequence identity.

30. A polynucleotide encoding the engineered Ebolavirus GP protein of claim 1 or claim 6.

31. A polynucleotide encoding the vaccine composition of claim 26.