CLAIMS:

1. A wing system for an air vehicle, the air vehicle having a fuselage including a fuselage longitudinal axis, the wing system comprising:

a set of wings, configured for transitioning between a stowed configuration and a deployed configuration, the set of wings including:

a first said wing having a first wing tip, a first wing longitudinal axis, and a first pivot axis;

a second said wing having a second wing tip, a second wing longitudinal axis, and a second pivot axis;

wherein said first pivot axis and said second pivot axis are non-coaxial;

wherein in the stowed configuration, the first wing and the second wing are in overlying relationship such that at least a majority of a pressure surface of one of said first wing and said second wing is facing a suction surface of the other one of said one of said first wing and said second wing, and said first wing tip is spaced from said second wing tip by a first lateral spacing, wherein in the stowed configuration the first wing and the second wing are generally aligned with the fuselage longitudinal axis; and

wherein in the deployed configuration, the first wing is oriented with respect to the second wing such that said first wing tip is spaced from said second wing tip by a second lateral spacing greater than said first lateral spacing;

wherein said transitioning comprises a pivoting operation, comprising:

pivoting said first wing about said first pivot axis between the stowed configuration and the deployed configuration;

pivoting said second wing about said second pivot axis between the stowed configuration and the deployed configuration;

wherein the wing system is configured for providing a levelling operation configured for levelling the first wing and the second wing with respect to one another from the overlying relationship in the stowed configuration, to a leveled relationship in the deployed configuration; and

wherein the wing system is configured for providing a translation operation configured for selectively translating the first wing and the second wing along a

stroke direction through a stroke length, between a first axial position corresponding to the stowed configuration, and a second axial position corresponding to the deployed configuration.

2. The wing system according to claim 1 wherein the wing system is configured for synchronizing said levelling operation with said pivoting operation.

3. The wing system according to claim 1, wherein the wing system is configured for synchronizing said translation operation with said pivoting operation.

4. The wing system according to any one of claims 1 to 3, wherein said first pivot axis is parallel with respect to said second pivot axis.

5. The wing system according to claim 4, wherein said first pivot axis is laterally spaced with respect to said second pivot axis by a lateral spacing.

6. The wing system according to any one of claims 1 to 5, comprising a deployment mechanism configured for selectively transitioning the first wing and the second wing between said stowed configuration and said deployed configuration.

7. The wing system according to claim 6, wherein said deployment mechanism comprises an actuator configured for selectively driving operation of the deployment mechanism.

8. The wing system according to any one of claims 6 to 7 wherein said deployment mechanism is configured for self locking.

9. The wing system according to any one of claims 6 to 8, wherein said first wing comprises a first pivot shaft coaxial with the first pivot axis, and wherein said second wing comprises a second pivot shaft coaxial with the second pivot axis.

10. The wing system according to claim 9, wherein said deployment mechanism comprises a load bearing bulkhead, wherein said first wing is pivotably mounted to said load bearing bulkhead via said first pivot shaft, and said second wing is pivotably mounted to said load bearing bulkhead via said second pivot shaft.

11. The wing system according to any one of claims 9 to 10, wherein said deployment mechanism is configured for providing in said pivoting operation a pivoting synchronization operation comprising synchronizing pivoting of said first wing about said first pivot axis in a first rotational direction with pivoting of said second wing about said second pivot axis in a second rotational direction, opposite to said first rotational direction.

12. The wing system according to claim 11, wherein said deployment mechanism comprises a meshed gear arrangement for providing said synchronization operation.

13. The wing system according to claim 12, wherein said meshed gear arrangement comprises a first gear wheel fixedly mounted to said first pivot shaft and co-axial with said first pivot axis, and a second gear wheel fixedly mounted to said second pivot shaft and co-axial with said second pivot axis, wherein said first gear wheel is meshed with respect to said second gear wheel.

14. The wing system according to claim 13, wherein said actuator comprises a motor operatively coupled to said meshed gear arrangement and configured for selectively providing a torque to at least one of said first gear wheel and said second gear wheel to drive said meshed gear arrangement to thereby provide said synchronization operation.

15. The wing system according to any one of claims 6 to 14, wherein said deployment mechanism comprises a leveling arrangement for providing and for synchronizing said levelling operation with said pivoting operation.

16. The wing system according to claim 15, including one of the following:

- wherein at least one of said first wing and said second wing is movably mounted to the respective said first shaft or said second shaft with respect to one degree of freedom in translation parallel to the respective said first pivot axis or said second pivot axis;
- wherein said first wing is fixedly mounted to said first shaft, and wherein said second wing is movably mounted to said second shaft with respect to one degree of freedom in translation parallel to said second pivot axis;
- wherein said first wing is fixedly mounted to said first shaft, and wherein said second wing is movably mounted to said second shaft with respect to one degree of freedom in translation parallel to said second pivot axis, and, wherein said second shaft is in the form of a male spline shaft, and wherein the said second wing is movably mounted to said second shaft via a female spline coupling complementary to said male spline shaft.

17. The wing system according to any one of claims 15 to 16, wherein said leveling arrangement comprises a cam arrangement operatively coupled to the second wing.

18. The wing system according to claim 17, wherein said cam arrangement comprises a cam follower and a cam rail.

19. The wing system according to claim 18, wherein said cam rail comprises at least one helical cam rail, fixedly mounted with respect to said load-bearing bracket and having a helical axis co-axial with said second pivot axis, and wherein said cam follower fixedly mounted to the second wing, such that movement of the cam follower along said cam rail causes the second wing to translate along said degree of freedom with respect to said second pivot shaft in said levelling operation.

20. The wing system according to any one of claims 6 to 19, wherein said deployment mechanism comprises a translation arrangement configured for synchronizing said translation operation with said pivoting operation.

21. The wing system according to claim 20, wherein said translation arrangement comprises a rail system configured to be fixedly mounted to the air vehicle, and wherein said bracket is moveably mounted to said rail system to enable said bracket to be translated along said stroke direction through said stroke length.

22. The wing system according to claim 21, wherein said translation arrangement comprises a rack and pinion arrangement, comprising a pinion gear rotatably mounted to said bracket, and a rack gear mounted in fixed spatial relationship with respect to said rail system, wherein said pinion gear is coupled with said meshed gear arrangement, such that actuation of said meshed gear system causes rotation of said pinion gear, which in turn turns with respect to the rack gear causing translation of the load-bearing bracket along said stroke direction.

23. The wing system according to claim 22, wherein said translation arrangement comprises at least two said pinion gears of different diameter one from the other, each said pinion gear being alternately rotatably mounted to said bracket to correspondingly provide a different said stroke length.

24. A deployment mechanism for a wing system for an air vehicle, the wing system comprising a set of wings including a first wing and a second wing, the deployment mechanism being configured for enabling transitioning the wing system between a stowed configuration and a deployed configuration, and comprising:

a first shaft configured for enabling the first wing to be mounted thereto, the first shaft having a first pivot axis, a second shaft configured for enabling the second wing to be mounted thereto, the second shaft having a second pivot axis, wherein said first pivot axis and said second pivot axis are non-coaxial, and wherein in the stowed configuration the first shaft and the second shaft are

configured for mounting the first wing and the second wing, respectively, in overlying arrangement;

a pivoting arrangement configured for providing a pivoting operation comprising pivoting of said first shaft about said first pivot axis in a first rotational direction with pivoting of said second shaft about said second pivot axis in a second rotational direction, opposite to said first rotational direction;

a leveling arrangement for providing a levelling operation configured for transitioning the first wing and the second wing with respect to one another from a non-leveled relationship in the stowed configuration, to a leveled relationship in the deployed configuration;

a translation arrangement configured for providing a translation operation configured for selectively translating, in operation of the deployment system, the first wing and the second wing along a stroke direction through a stroke length, between a first axial position corresponding to the stowed configuration, and a second axial position corresponding to the deployed configuration.

25. The deployment mechanism according to claim 24, wherein the deployment mechanism is configured for synchronizing said translation operation with said pivoting operation via a first synchronizing operation.

26. The deployment mechanism according to any one of claims 24 to 25, wherein said leveling arrangement is configured for synchronizing said levelling operation with said pivoting operation,.

27. The deployment mechanism according to claim 26, wherein the deployment mechanism is configured for synchronizing said levelling operation with said pivoting operation.

28. The deployment mechanism according to any one of claims 24 to 27, wherein said first pivot axis is parallel with respect to said second pivot axis, and wherein said first pivot axis is laterally spaced with respect to said second pivot axis by a lateral spacing.

29. The deployment mechanism according to claim 28, wherein said deployment mechanism comprises an actuator configured for selectively driving operation of the deployment mechanism, and wherein optionally said deployment mechanism is configured for self locking.

30. A wing system, comprising the deployment mechanism as defined in any one of claims 24 to 29.

31. A wing system for an air vehicle, the air vehicle having a fuselage including a fuselage section and a fuselage longitudinal axis, the wing system comprising:

a set of wings, including a first said wing having a first wing longitudinal axis, and a second said wing having a second wing longitudinal axis, and configured for transitioning between a stowed configuration and a deployed configuration;

wherein in the stowed configuration, the first wing and the second wing are generally aligned with the fuselage longitudinal axis; and

wherein in the deployed configuration, the first wing is oriented with respect to the second wing such that the wings tips are more spaced from one another than in the stowed configuration;

and further comprising a deployment mechanism including a pivoting arrangement configured for selectively providing a wing pivoting operation, comprising:

pivoting said first wing about a first pivot axis between the stowed configuration and the deployed configuration;

pivoting said second wing about a second pivot axis between the stowed configuration and the deployed configuration;

wherein said first pivot axis and said second pivot axis are non-coaxial;

the deployment mechanism comprising a translation arrangement configured for selectively providing a displacement operation concurrent with the wing pivoting operation, said displacement operation comprising translating the first wing and the second wing through a stroke length concurrent with said

pivoting, between a first axial position corresponding to the stowed configuration, and a second axial position corresponding to the deployed configuration;

wherein said deployment mechanism is configured for enabling changing a magnitude of said stroke length while unaffecting said wing pivoting operation;

and

wherein the wing pivoting arrangement and the translation arrangement are coupled to be actuatable via a common actuator.

32. A deployment mechanism for a wing system for an air vehicle, the wing system comprising a set of wings including a first wing and a second wing, the deployment mechanism being configured for enabling transitioning the wing system between a stowed configuration and a deployed configuration, and comprising:

the deployment mechanism including a pivoting arrangement configured for selectively providing a wing pivoting operation, comprising:

pivoting said first wing about a first pivot axis between the stowed configuration and the deployed configuration;

pivoting said second wing about a second pivot axis between the stowed configuration and the deployed configuration;

wherein said first pivot axis and said second pivot axis are non-coaxial;

the deployment mechanism comprising a translation arrangement configured for selectively providing a displacement operation concurrent with the wing pivoting operation, said displacement operation comprising translating the first wing and the second wing through a stroke length concurrent with said pivoting, between a first axial position corresponding to the stowed configuration, and a second axial position corresponding to the deployed configuration;

wherein said deployment mechanism is configured for enabling changing a magnitude of said stroke length while unaffecting said wing pivoting operation;

and

wherein the wing pivoting arrangement and the translation arrangement are coupled to be actuatable via a common actuator.

33. An air vehicle comprising at least one wing system as defined in claim 31.

34. A method of operating an air vehicle, comprising:

- providing an air vehicle as defined in claim 33;
- providing a said magnitude of said stroke length while unaffecting said wing pivoting operation.

35. An air vehicle comprising at least one wing system as defined in any one of claims 1 to 23, 30 to 31.

36. The air vehicle according to claim 35, wherein the air vehicle comprises a fuselage, and wherein the at least one wing system is mounted to a lower side of the fuselage.

37. The air vehicle according to any one of claims 33, 35- 36 wherein the air vehicle is a UAV.

38. A method of operating a wing system, comprising:

- providing a wing system as defined in any one of claims 1 to 23, 30 to 31;
- selectively operating the respective wing system to transition the wing system from the stowed configuration to the deployed configuration.

39. The method of operating an air vehicle, according to claim 38, further comprising:

- selectively operating the respective wing system to transition the wing system from the deployed configuration to the stowed configuration.

40. A method of operating an air vehicle, comprising:

(a) providing an air vehicle comprising a wing system as defined in any one of claims 1 to 23, 30 to 31, the air vehicle being encapsulated in a fairing concurrent with the wing system being in the stowed configuration;

(b) launching the encapsulated air vehicle;

(c) separating the air vehicle from the fairing;

(d) selectively operating the respective wing system to transition the wing system from the stowed configuration to the deployed configuration.

41. The method according to claim 40, wherein step (b) comprises any one of:

- launching the encapsulated air vehicle via a launch barrel;
- launching the encapsulated air vehicle using a booster rocket;
- launching the encapsulated air vehicle from a carrier aircraft.