CLAIMS:

1. A refueling device for use in in-flight refueling operation, comprising:

(a) a body configured for being towed by a tanker aircraft in a forward direction via a fuel hose at least during in-flight refueling operation, the body having a body longitudinal axis and a neutral point;

(b) a boom member carried by the body, the boom member having a fuel delivery nozzle, the fuel delivery nozzle being configured for selectively engaging with a fuel receptacle in a receiver aircraft to enable fuel to be transferred from said fuel hose to the receiver aircraft during said in-flight refueling operation;

(c) spatial control system configured for selectively providing stability and control to the refueling device;

(d) wherein at least during refueling operation the fuel delivery nozzle is longitudinally forward of the neutral point.

2. The refueling device according to claim 1, the boom member comprising a forward boom member portion having a forward boom axis, and an aft boom member portion having an aft boom axis.

3. The refueling device according to claim 2, wherein the boom member is mounted to the body via the forward boom member portion, and wherein the fuel delivery nozzle is located on said aft boom member.

4. The refueling device according to claim 2 or claim 3, wherein the boom member is pivotably mounted to the body via the forward boom member portion.

5. The refueling device according to any one of claims 2 to 4, wherein said boom member is pivotably mounted with respect to the body.

6. The refueling device according to any one of claims 4 to 5, wherein said boom member is pivotable with respect to the body between a retracted position and a deployed position.

7. The refueling device according to claim 6, wherein in said deployed position the fuel delivery nozzle is configured to enable in-flight refueling.

8. The refueling device according to any one of claims 6 to 7, wherein in said deployed position the fuel delivery nozzle is at a transverse spacing with respect to the body to enable in-flight refueling.

9. The refueling device according to any one of claims 6 to 8, wherein in said retracted position the fuel delivery nozzle is located closer with respect to the body than in the deployed position.

10. The refueling device according to any one of claims 2 to 9, wherein said forward boom member portion is connected to said aft boom member portion via a boom elbow.

11. The refueling device according to any one of claims 2 to 10, wherein the forward boom axis and the aft boom axis are in non-parallel spatial relationship.

12. The refueling device according to any one of claims 2 to 10, wherein the forward boom axis and the aft boom axis are in a fixed non-parallel spatial relationship irrespective of whether the boom member is in the retracted position or the deployed position.

13. The refueling device according to any one of claims 2 to 12, wherein the forward boom axis is angularly displaced with respect to the aft boom axis by a first angular disposition.

14. The refueling device according to claim 13, wherein said first angular disposition is between 60° and 120°.

15. The refueling device according to any one of claims 5 to 14, wherein said boom member is in said deployed position during said in-flight refueling operation.

16. The refueling device according to any one of claims 2 to 15, wherein at least during said in-flight refueling operation, said aft boom axis is at a second angular disposition with respect to said body longitudinal axis, said second angular disposition being non-zero.

17. The refueling device according to any one of claims 4 to 16, wherein said boom member pivots as a rigid body.

18. The refueling device according to claim 2 or claim 3, wherein the boom member is fixedly mounted to the body via the forward boom member portion.

19. The refueling device according to claim 18, wherein the forward boom member portion is in the form of a fin.

20. The refueling device according to any one of claims 2 to 15, wherein at least during said in-flight refueling operation, said aft boom axis is at a third angular disposition with respect to a forward direction of said refueling device.

21. The refueling device according to claim 20, wherein said third angular disposition is such as to ensure that the aft boom axis is at a predetermined design angle with respect to the receiver aircraft.

22. The refueling device according to claim 21, wherein said design angle is about 30°.

23. The refueling device according to any one of claims 20 to 22, wherein said refueling device is configured for maintaining said third angular disposition between said aft boom axis and said forward direction at least prior to engagement of said fuel delivery nozzle with a fuel receptacle of a receiver aircraft that is flying in formation aft of the tanker aircraft.

24. The refueling device according to any one of claims 1 to 23, wherein said spatial control system is further configured for selectively providing control moments in at least one of pitch, yaw and roll wherein to enable the refueling device to be flown while towed by the tanker aircraft in said forward direction via said fuel hose.

25. The refueling device according to any one of claims 1 to 24, wherein said spatial control system comprises selectively controllable aerodynamic control system.

26. The refueling device according to claim 25, wherein said selectively controllable aerodynamic control system comprises a forward set of aerodynamic control surfaces mounted to said body, and an aft set of aerodynamic control surfaces mounted to said body in longitudinally aft spaced relationship with respect to said forward set of aerodynamic control surfaces.

27. The refueling device according to claim 26, wherein said forward set of aerodynamic control surfaces comprises a canard configuration, and said aft set of aerodynamic control surfaces comprises one or more wing elements

28. The refueling device according to claim 26 or claim 27, wherein said aft set of aerodynamic control surfaces comprises an H-wing configuration, comprising two vertical wing stabilizers, one each on either side of a respective wing.

29. The refueling device according to any one of claims 26 to 28, wherein said forward set of aerodynamic control surfaces comprises an H-canard configuration, comprising two vertical canard stabilizers, one each on either side of a respective canard.

30. The refueling device according to any one of claims 1 to 29, wherein said spatial control system is configured for enabling the refueling device to be steered in one, or two, or three degrees of freedom in translation, and in one, or two, or three degrees of freedom in rotation, independently of the tanker aircraft or of the refueling aircraft.

31. The refueling device according to any one of claims 1 to 30, further comprising an aerodynamic stabilizer arrangement, different from the spatial control system**.**

32. The refueling device according to claim 31, wherein said aerodynamic stabilizer arrangement is in the form of a drogue structure having a stowed configuration, in which drogue structure generates a minimum drag, and a deployed configuration in drogue structure generates greater drag than in the inactive configuration.

33. The refueling device according to any one of claims 1 to 32, further comprising a force generating arrangement configured for selectively generating a force along said aft boom axis in a direction towards said fuel delivery nozzle.

34. The refueling device according to claim 33, wherein said force generating arrangement is configured for selectively generating said force along said aft boom axis in a direction towards said fuel delivery nozzle responsive to said fuel delivery nozzle being in predetermined proximity to the fuel receptacle of the receiver aircraft wherein to force said fuel delivery nozzle into engagement with the fuel receptacle.

35. The refueling device according to any one of claims 1 to 34, said body comprising a fuel delivery lumen configured for fluid communication with said fuel hose and said boom member at least during the in-flight refueling operation, wherein said body comprises a coupling having a hose interface configured for connecting said lumen to the fuel hose, said coupling configured for allowing relative rotation between the hose and said body in at least one degree of freedom while maintaining said fuel communication.

36. The refueling device according to any one of claims 1 to 35, further comprising a data acquisition system configured for providing spatial data relating to a relative spatial disposition between said fuel delivery nozzle and said fuel receptacle, to enable selectively controlling the refueling device to provide automatic or autonomous or manual engagement of the fuel delivery nozzle to the fuel receptacle of the receiver aircraft.

37. The refueling device according to any one of claims 1 to 36, further comprising a suitable controller for controlling operation thereof.

38. The refueling device according to any one of claims 1 to 37, wherein the fuel delivery nozzle is rotatably mounted to a free end of the boom member via a nozzle rotation center of the fuel delivery nozzle, and wherein at least during refueling operation the nozzle rotation center is longitudinally forward of the neutral point.

39. A refueling system comprising a refueling fuel reservoir connected to a refueling device via a hose, the refueling device being as defined in any one of claims 1 to 38.

40. A tanker aircraft comprising at least one refueling system as defined in claim 39.

41. A refueling device for use in in-flight refueling operation between a tanker aircraft and a receiver aircraft, comprising:

- a selectively steerable body configured for being towed by a tanker aircraft via a fuel hose at least during in-flight refueling, and comprising a boom member having an aft boom axis and a fuel delivery nozzle, said boom member configured to enable

fuel to be transferred from said fuel hose to a receiver aircraft along said aft boom axis during said in-flight refueling operation;

- wherein at least during said in-flight refueling operation the fuel delivery nozzle is longitudinally forward of a neutral point of the refueling device.

42. The refueling device according to claim 41, wherein the fuel delivery nozzle is rotatably mounted to a free end of the boom member via a nozzle rotation center of the fuel delivery nozzle, and wherein at least during refueling operation the nozzle rotation center is longitudinally forward of the neutral point.

43. A boom member for a refueling device for use in in-flight refueling operation, the boom member comprising:

a forward boom member portion having a forward boom axis, and an aft boom member portion having an aft boom axis,

the forward boom member portion being connected to the aft boom member portion via a boom elbow portion wherein the forward boom axis is angularly displaced with respect to the aft boom axis by a non-parallel angular disposition,

wherein the boom member is pivotably mountable with respect to the refueling device about a pivot axis, to enable, in use, the boom member to be selectively pivotable about the pivot axis with respect to the refueling device between a retracted position and a deployed position; and

wherein the pivot axis is comprised in the forward boom member portion.

44. The boom member according to claim 43, wherein said angular disposition is between 60° and 120°.

45. The boom member according to any one of claims 43 to 44, wherein said boom member is configured for pivoting about the pivot axis as a rigid body.