CLAIMS

1. An aircraft comprising:

an aircraft propulsion system for propelling the aircraft; and

a self-propelled payload (SPP) system mounted onto the aircraft, wherein the SPP system comprises an SPP propulsion unit independent of the aircraft propulsion system, the SPP propulsion unit is configured to generate thrust in first and second opposite directions, the SPP system includes a controller for controlling the SPP propulsion unit to compensate for a change in a center of gravity of the aircraft due to a payload of the aircraft which includes the SPP system; and

wherein compensating for the change in the center of gravity due to the payload comprises controlling the thrust in the first and second opposite directions, wherein compensating for the change in the center of gravity improves operational effectiveness of the aircraft.

2. The aircraft of claim 1 wherein the aircraft comprises an unmanned aircraft.

3. The aircraft of claim 1 wherein the payload comprises at least one additional payload and the SPP system.

4. The aircraft of claim 1 wherein the SPP system further comprises:

a SPP coupling joint which is configured to be rotatably coupled to the aircraft, wherein the SPP coupling joint rotates about a first axis which is perpendicular to a plane of the aircraft;

a SPP body, wherein the SPP body is coupled to the SPP coupling joint, wherein the SPP body is coupled by a SPP body joint to the SPP coupling joint, the SPP body joint is configured to rotate about a second axis which is perpendicular to the first axis; and

a SPP payload coupled to the SPP body, wherein the SPP propulsion unit is coupled to the SPP payload.

5. A self-propelled payload (SPP) system for an aircraft comprising:

an SPP propulsion unit, wherein the SPP propulsion unit is independent of the aircraft's propulsion system;

an SPP controller, the SPP controller is configured to control magnitude and direction of thrust of the SPP propulsion unit to compensate for a change in a center of gravity of the aircraft due to a payload of the aircraft which includes the SPP system;

a SPP coupling joint which is configured to be rotatably coupled to the aircraft, wherein the coupling joint rotates about a first axis which is perpendicular to a plane of the aircraft;

a SPP body, wherein the SPP body is coupled to the SPP coupling joint, wherein the SPP body is coupled by a SPP body joint to the SPP coupling joint, the SPP body joint is configured to rotate about a second axis which is perpendicular to the first axis;

a SPP payload coupled to the SPP body, wherein the SPP propulsion unit is coupled to the SPP payload; and

wherein compensating for the change in the center of gravity due to the payload improves operational effectiveness of the aircraft.

6. The SPP system of claim 5, wherein the SPP propulsion unit is configured to generate the thrust in the first and second opposite directions, the first and second opposite directions are parallel to a plane of a base of the SPP body.

7. The SPP system of claim 5, wherein the SPP propulsion unit is a propeller-based propulsion unit, a gas propelled propulsion unit, or a digital solid state propulsion unit.

8. The SPP system of claim 7, wherein the SPP system further comprises:

a force monitoring unit disposed on the SPP body, the force monitoring unit includes sensors configured to detect a position change of the payload; and

wherein the force monitoring unit is configured to communicate with the SPP controller to determine in part the magnitude and direction of the thrust.

9. The SPP system of claim 8, wherein the sensors comprises:

horizontal situation indicators (HIS);

an inertia measurement unit (IMU);

spring tensioned position sensors; or

a combination thereof.

10. The SPP system of claim 9, wherein the SPP controller is configured to facilitate a control feedback loop for dynamic force implementation, the control feedback loop comprising

detecting and comparing a position change of the payload to a pre-defined position via an error calculation unit; and

controlling the magnitude and direction of the thrust to adjust the SPP system to the pre-defined position to achieve a desired center of gravity based on a configuration of the aircraft.

11. The SPP system of claim 10, wherein the SPP body joint is a motorized joint controlled by the SPP controller to facilitate controlling the thrust in first and second opposite directions.

12. The SPP system of claim 5, wherein the SPP body joint is a mechanical joint configured to facilitate mechanical coupling for the SPP propulsion unit to independently control the direction of the thrust.

13. A method of operating an aircraft comprising:

providing an aircraft with an aircraft propulsion system for propelling the aircraft;

mounting an SPP system onto the aircraft, wherein the SPP system includes

an SPP propulsion unit independent of the aircraft's propulsion system, wherein the SPP propulsion unit is configured to generate thrust in first and second opposite directions,

an SPP controller, the SPP controller is configured to control magnitude and direction of thrust of the SPP propulsion unit to compensate for a change in a center of gravity of the aircraft due to a payload of the aircraft which includes the SPP system; and

operating the aircraft using the aircraft propulsion system, wherein during operation, the SPP system is activated to compensate for the change in the center of gravity due to the payload which comprises controlling the thrust

in the first and second opposite directions, to improve operational effectiveness of the aircraft.

14. The method of claim 13, wherein the SPP propulsion unit is a propeller-based propulsion unit, a gas propelled propulsion unit, or a digital solid state propulsion unit.

15. The method of claim 13 wherein the SPP system further comprises:

a SPP coupling joint which is configured to be rotatably coupled to the aircraft, wherein the coupling joint rotates about a first axis which is perpendicular to a plane of the aircraft;

a SPP body, wherein the SPP body is coupled to the SPP coupling joint, wherein the SPP body is coupled by a SPP body joint to the SPP coupling joint, the SPP body joint is configured to rotate about a second axis which is perpendicular to the first axis; and

a SPP payload coupled to the SPP body, wherein the SPP propulsion unit is coupled to the SPP payload.

16. The method of claim 15, wherein the SPP system further comprises:

a force monitoring unit disposed on the SPP body, the force monitoring unit includes sensors configured to detect a position change of the SPP payload; and

wherein the force monitoring unit is configured to communicate with the SPP controller to determine in part the magnitude and direction of the thrust.

17. The method of claim 16, wherein the sensors comprises:

horizontal situation indicators (HIS);

an inertia measurement unit (IMU);

spring tensioned position sensors; or

a combination thereof.

18. The method of claim 17, wherein the SPP controller is configured to facilitate a control feedback loop for dynamic force implementation, the control feedback loop comprising

detecting and comparing a position change of the payload to a pre-defined position via an error calculation unit; and

controlling the magnitude and direction of the thrust to adjust the SPP system to the pre-defined position to achieve a desired center of gravity based on a configuration of the aircraft.

19. The method of claim 18, wherein the SPP body joint is a motorized joint controlled by the SPP controller to facilitate controlling the thrust in the first and second opposite directions.

20. The method of claim 13, wherein the first and second opposite directions of the thrust are parallel to a plane of a base of the SPP body.