CLAIMS

1. An aerial vehicle, comprising:

an airframe;

a horizontal propulsion unit mounted to the airframe and oriented to provide horizontal propulsion to the aerial vehicle; and

a vertical propulsion unit mounted to the airframe and oriented to provide vertical propulsion to the aerial vehicle, the vertical propulsion unit including:

a motor rotor that spins about a central rotational axis; propeller blades each having a proximal base and a distal tip; and

pivot mounts each coupling the proximal base of a corresponding one of the propeller blades to the motor rotor, wherein the propeller blades each freely pivot at the proximal base about a corresponding offset pivoting axis that is offset from the central rotational axis of the motor rotor,

wherein the propeller blades are adapted to pivot to a deployed position under a centrifugal force when the motor rotor of the vertical propulsion unit is spinning to provide the vertical propulsion and pivot to a stowed position due to a wind resistance resulting from a forward motion of the aerial vehicle when the motor rotor of the vertical propulsion unit is not spinning.

2. The aerial vehicle of claim 1, wherein the stowed position has a reduced drag profile during the forward motion of the aerial vehicle.

3. The aerial vehicle of claim 2, wherein the vertical propulsion unit further includes:

stop blocks each mounted between the propellers blades at a different circumferential position about the central rotational axis, the stop blocks positioned to limit an amount of pivoting of the propeller blades in either rotational direction about the pivot points and to prevent aerodynamic surfaces of the propeller blades from contacting each other in the stowed position.

4. The aerial vehicle of claim 3, wherein one or more surfaces of the stop blocks that contact the propeller blades are fabricated of a material that is softer than the propeller blades.

5. The aerial vehicle of claim 1, wherein the vertical propulsion unit further includes:

a holder base secured to the motor rotor;

a holder cap; and

bearings forming the pivot mounts, the bearings each extending between the holder base and the holder cap along the corresponding offset pivoting axis, wherein a hole in the proximal base of each of the propeller blades fits around a corresponding one of the bearings and the propeller blades are clamped between the holder base and the holder cap.

6. The aerial vehicle of claim 5, wherein the bearings comprise female threaded bosses extending from the holder base, and wherein the holder cap is secured over the female threaded bosses with mechanical fasteners that thread through the holder cap into the female threaded bosses.

7. The aerial vehicle of claim 5, wherein the holder cap is secured to the holder base with a mechanical fastener aligned with the central rotational axis.

8. The aerial vehicle of claim 5, wherein the holder base comprises a clip-in rotor cap, and wherein the vertical propulsion unit further includes:

a clip-in base mount disposed on the motor rotor, wherein the clip-in rotor cap is shaped to mate with and detachably clip into the clip-in base mount.

9. The aerial vehicle of claim 8, wherein the clip-in rotor cap includes:

holding cams that mate to one or more cam grooves disposed in the clip-in base mount; and a spring cavity; and

a spring disposed in the spring cavity that asserts a repelling force between the clip-in base mount and the clip-in rotor cap when the clip-in rotor cap is mated to the clip-in base mount.

10. The aerial vehicle of claim 9, wherein the clip-in base mount comprises:

a raised alignment ring extending at least partially around a perimeter of the clip-in base mount; the one or more cam grooves disposed along the raised alignment ring; and

detents disposed in the one or more cam grooves to provide resistance to a rotational separation of the holding cams from the one or more cam grooves.

11. The aerial vehicle of claim 10, wherein a beveling of the detents along with a direction of the rotational separation of the holding cams from the one or more grooves enables a pop off separation of the clip-in rotor cap and the propeller blades from the motor rotor in an event that a physical object of a threshold mass impacts one or more of the propeller blades when the propeller blades are spinning.

12. A propulsion unit of an aerial vehicle, comprising:

a motor rotor that spins about a central rotational axis; propeller blades each having a proximal base and a distal tip;

pivot mounts each coupling the proximal base of a corresponding one of the propeller blades to the motor rotor, wherein the propeller blades each freely pivot at the proximal base about a corresponding offset pivoting axis that is offset from the central rotational axis of the motor rotor,

wherein the propeller blades are adapted to pivot to a deployed position under a centrifugal force when the motor rotor is spinning and pivot to a stowed position due to a wind resistance resulting from a forward motion of the aerial vehicle when the motor rotor is not spinning.

13. The propulsion unit of claim 12, wherein the stowed position has a reduced drag profile due to the wind resistance resulting from the forward motion of the aerial vehicle.

14. The propulsion unit of claim 13, further comprising:

stop blocks each mounted between the propellers blades at a different circumferential position about the central rotational axis, the stop blocks positioned to limit an amount of pivoting of the propeller blades in either rotational direction about the pivot points and to prevent aerodynamic surfaces of the propeller blades from contacting each other in the stowed position.

15. The propulsion unit of claim 12, further comprising:

a holder base secured to the motor rotor;

a holder cap; and

bearings forming the pivot mounts, the bearings each extending between the holder base and the holder cap along the corresponding offset pivoting axis, wherein a hole in the proximal base of each of the propeller blades fits around a corresponding one of the bearings and the propeller blades are clamped between the holder base and the holder cap.

16. The propulsion unit of claim 15, wherein the bearings comprise female threaded bosses extending from the holder base, and wherein the holder cap is secured over the female threaded bosses with mechanical fasteners that thread through the holder cap into the female threaded bosses.

17. The propulsion unit of claim 15, wherein the holder cap is secured to the holder base with a mechanical fastener aligned with the central rotational axis.

18. The propulsion unit of claim 15, wherein the holder base comprises a clip-in rotor cap, and wherein the propulsion unit further includes:

a clip-in base mount disposed on the motor rotor, wherein the clip-in rotor cap is shaped to mate with and detachably clip into the clip-in base mount.

19. The propulsion unit of claim 18, wherein the clip-in rotor cap includes:

holding cams that mate to one or more cam grooves disposed in the clip-in base mount; and a spring cavity; and

a spring disposed in the spring cavity that asserts a repelling force between the clip-in base mount and the clip-in rotor cap when the clip-in rotor cap is mated to the clip-in base mount.

20. The propulsion unit of claim 19, wherein the clip-in base mount comprises:

a raised alignment ring extending at least partially around a perimeter of the clip-in base mount; the one or more cam grooves disposed along the raised alignment ring; and

detents disposed in the one or more cam grooves to provide resistance to a rotational separation of the holding cams from the one or more cam grooves.

21. The propulsion unit of claim 20, wherein a beveling of the detents along with a direction of the rotational separation of the holding cams from the one or more grooves enables a pop off separation of the clip-in rotor cap and propeller blades from the motor rotor in an event that a physical object of a threshold mass impacts one or more of the propeller blades when the propeller blades are spinning.

22. The propulsion unit of claim 12, wherein the corresponding offset pivoting axis of each of the propeller blades is parallel to the central rotational axis of the motor rotor.

23. A propulsion unit of an aerial vehicle, comprising:

a motor rotor that spins about a central rotational axis;

propeller blades each having a proximal base and a distal tip;

pivot mounts each coupling the proximal base of a corresponding one of the propeller blades to the motor rotor, wherein the propeller blades each freely pivot at the proximal base about a corresponding offset pivoting axis that is offset from the central rotational axis of the motor rotor; and

stop blocks each mounted between the propellers blades at a different circumferential position about the central rotational axis, the stop blocks positioned to limit an amount of pivoting of the propeller blades in either rotational direction about the pivot points and to prevent aerodynamic surfaces of the propeller blades from contacting each other in a stowed position,

wherein one or more surfaces of the stop blocks that contact the propeller blades are fabricated of a material that is softer than the propeller blades,

wherein the propeller blades are adapted to pivot to a deployed position under a centrifugal force when the motor rotor is spinning and pivot to a stowed position due to a wind resistance resulting from a forward motion of the aerial vehicle when the motor rotor is not spinning.