VARIOCOPTER

The layout of existing vertical takeoff and landing (VTOL) fixed wing VARIOCOPTER is mostly push back single thrust design. In this layout form, the thrust is limited, and the thrust system has low reliability. In addition, the heading control mode of existing VTOL VARIOCOPTER is to control the steering of VARIOCOPTER through rudder or aileron. If the rudder or aileron fails, the reliability of VARIOCOPTER will be low.

The thrust motors of existing VTOL VARIOCOPTER are mostly installed at the rear of the longitudinal axis of the fuselage, which is very inconvenient for the layout of VARIOCOPTER with limited fuselage space.

Disclosure relates to a fixed wing VARIOCOPTER, which is used to solve the problem of low reliability of VARIOCOPTER thrust system and active yaw in the prior art.

The Disclosure provides a fixed wing VARIOCOPTER with external parachute droppable discharged external batteries, comprising:

Propellers arranged on both sides of the fixed wing VARIOCOPTER in parallel and providing thrust for the fixed wing VARIOCOPTER, and the propellers arranged on both sides of the fixed wing VARIOCOPTER can rotate at different rotation speeds to realize the active yaw of the VARIOCOPTER.

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In an embodiment of the Disclosure, the disclosure also comprises a main body, a main wing, a front wing, and a linear support. The main wing comprises a left main wing and a right main wing, and the left main wing and the right main wing are positioned on the opposite sides of the main body, respectively. The front wing is positioned at the front side of the main wing. The front wing comprises a left front wing and a right front wing. The left front wing and the right front wing are engaged with the main body and are positioned on the opposite sides of the main body, respectively. The linear support comprises a left linear support and a right linear support. The longitudinal axes of the left linear support, the right linear support and the main body are arranged parallel to each other. The left linear support is engaged with the left main wing, and the right linear support is engaged with the right main wing;

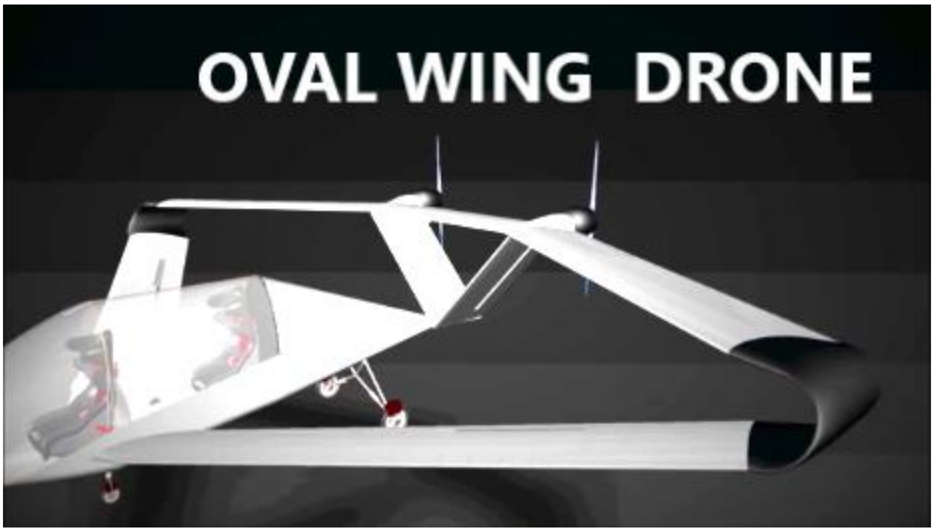
The propellers are arranged at the front ends of the left linear support and the right linear support, respectively; and/or, the propellers are arranged at the rear ends of the left linear support and the right linear support, respectively.

In an embodiment of the disclosure, the rotation axis of the propeller is parallel to the axis of the linear support.

In an embodiment of the disclosure, it also includes a motor and a microprocessor, the body of the motor is positioned inside the linear support and fixedly connected with the linear support, and the propeller is fixedly connected with the output shaft of the motor. The microprocessor is connected with the motor in communication and is used to control the rotation speed of the motor output shaft so that the rotation speeds of the two propellers are different.

In an embodiment of the disclosure, it also includes a rudder, which is used to control the active yaw of the fixed wing VARIOCOPTER.

In an embodiment of the disclosure, the fixed wing VARIOCOPTER only realizes the active yaw of the VARIOCOPTER through the different rotation speeds of the propellers on both sides of the fixed wing VARIOCOPTER.



A plurality of motors configured to drive the two propulsion propellers or the two traction propellers, respectively,

Wherein the thrust ratio provided by the two propulsion propellers, or the thrust ratio provided by the two traction propellers is changed to generate asymmetric thrust, which controls the active yaw of the UAV.

In an embodiment of the disclosure, the UAV also includes a rudder. When the rudder fails, the microprocessor can directly change the thrust ratio to compensate the rudder.

In an embodiment of the disclosure, the UAV also includes a plurality of lift propellers, which are configured to provide the UAV with vertical take-off and landing function.

In an embodiment of the disclosure, the UAV also comprises a left main wing and a right main wing, as well as a left front wing and a right front wing, wherein the left front wing and the right front wing are arranged in front of the left main wing and the right main wing, respectively.

In an embodiment of the disclosure, the UAV also includes a left linear support and a right linear support, wherein the left linear support and the right linear support are arranged parallel to each other, the left linear support connects the left main wing with the left front wing, and the right linear support connects the right main wing with the right front wing.

In an embodiment of the disclosure, the UAV also includes a detachable cargo hold or passenger cabin attached to its bottom side.

In an embodiment of the disclosure, the two propulsion propellers are arranged at the rear end of each of the left linear support and the right linear support, respectively.

In an embodiment of the disclosure, the two propulsion propellers are configured to provide thrust for the UAV.

In an embodiment of the disclosure, the two traction contra rotating propellers are configured to provide thrust for the UAV.

In an embodiment of the disclosure, the UAV is not provided with a rudder, and the UAV is a fixed wing UAV with vertical takeoff and landing function.

In an embodiment of the disclosure, the UAV does not have any control interface.

In an embodiment of the disclosure, the UAV also includes a left linear support and a right linear support, the left linear support connects the left main wing with the left front wing, and the right linear support connects the right main wing with the right front wing.

In an embodiment of the disclosure, the UAV also includes a detachable cargo hold or passenger cabin attached to its bottom side.

In an embodiment of the disclosure, the two propulsion propellers are configured to provide thrust for the UAV.

In an embodiment of the disclosure, the two traction propellers are configured to provide thrust for the UAV.

In an embodiment of the disclosure, the two propulsion propellers are arranged at the rear end of each of the left linear support and the right linear support, respectively.

The disclosure provides a fixed wing UAV, which comprises propellers arranged parallel to each other on both sides of the fixed wing UAV and providing thrust for the fixed wing UAV, and the propellers on both sides of the fixed wing UAV can rotate at different rotation speeds to realize the active yaw of the UAV. The fixed wing UAV provided by the disclosure drives the UAV to fly forward through the rotation of two propellers arranged parallel to each other on the fixed wing UAV to provide thrust for the fixed wing UAV. The two propellers may rotate at different rotation speeds, so that when the rudder fails, the two propellers can rotate at different rotation speeds to lead to different thrusts on both sides of the UAV and realize the active yaw of the UAV. Therefore, the fixed wing UAV provided by the disclosure improves the reliability of UAV thrust system and UAV active yaw.

Although the specifications contain many details of specific implementations, they should not be interpreted as limitations on any disclosure or the scope of protection that can be claimed, but as a description of the characteristics of specific implementations for specific embodiments. Some characteristics described in the context of different implementations in the specifications may also be combined in separate implementations. On the contrary, various characteristics described in the context of separate implementations may also be implemented in multiple implementations alone or in any suitable sub-combination. Further, although characteristics may be described as functioning in certain combinations and even initially in the context, in some cases, one or more characteristics from the described/claimed combination may be removed from the combination, and the described/claimed combination may be a sub-combination or a change to the sub-combination.

Many implementations have been described. However, it should be understood that various modifications may be made without departing from the spirit and scope of the disclosure. For example, the example operations, methods, or processes described herein may include more or less steps than those described. In addition, the steps in these example operations, methods, or processes may be performed in a different manner than those described or shown in the drawings.

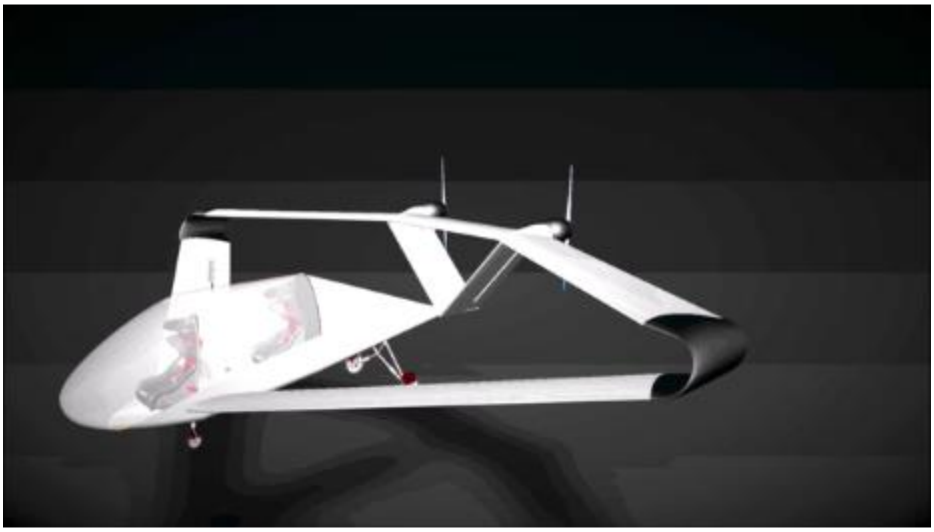
Thus, one subject matter of the invention is a drone comprising a front section, a wing structure borne by a rotor situated behind the front section, and a propeller at the rear, the wing structure comprising two wings rotating with the rotor, the wing structure being able to adapt between a flight configuration in which the rotor is stationary relative to the front section and the propulsion is provided by the propeller, and a rotary-wing flight configuration in which the rotor is rotationally driven relative to the front section, the rotor being connected to the front section with the possibility of orienting its axis of rotation relative to said front section so as to be able to steer the drone in the rotary-wing configuration by altering said orientation.

Thanks to the possibility of orienting the rotor in advancing flight in the rotary-wing configuration, the drone can be steered horizontally without the need to provide a complex cyclic-pitch control at the connection between the wings and the rotor.

With the drone comprising a stator bearing the rotor, the stator may be connected by at least one actuator to the front section, the actuator being designed to modify the orientation of the stator relative to the front section when actuated. As a preference, the drone comprises several actuators connecting the front section to the stator and, when actuated, making it possible to modify the orientation of the stator relative to the front section about at least two axes. As a greater preference, the drone comprises three actuators connecting the front section to the stator, these being positioned 120° apart about the longitudinal axis of the stator. These actuators are preferably linear actuators and are preferably each connected to the stator by a swivel joint.

Like a helicopter, the drone according to the invention may have a collective pitch control and a cyclic pitch control. The collective pitch control can be provided by actuators situated in the wings. The cyclic pitch control is achieved by inclining the stator. Thus, as a preference, the wings can pivot relative to the rotor in order to change incidence, thereby making it possible to change the collective pitch in the rotary-wing configuration.

As a preference, the drone comprises a swivel-joint connection between the front section and the stator. Such a connection advantageously is able to react some of the mechanical load between the front section and the stator. A deflector advantageously covers this joint, so as to maintain continuity of the fuselage at the transition between the front section and the stator, in spite of the changes in orientation of the latter.



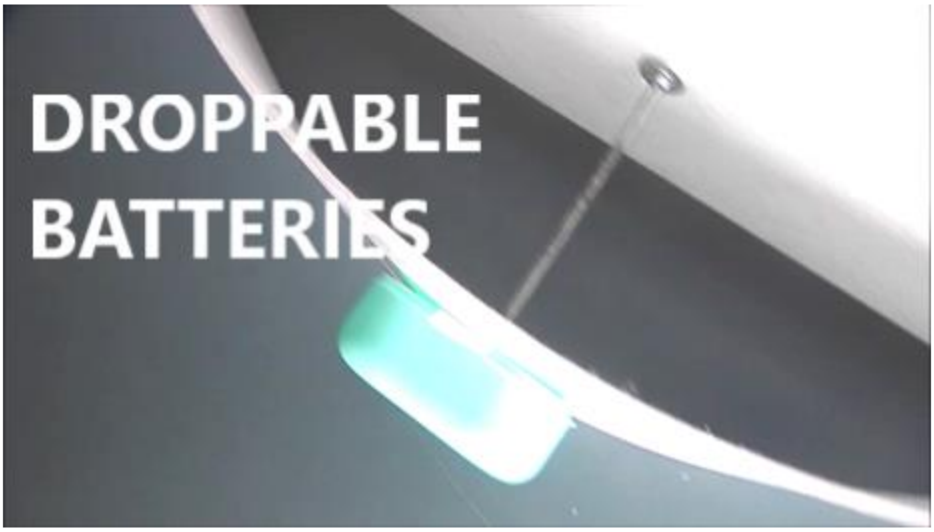
The drone comprises a motor for driving the rotation of the propeller. This motor is preferably housed in the front section, a drive train connecting the motor to the propeller, this drivetrain comprising a universal joint allowing drive to be transmitted from the motor to the propeller despite the changes in orientation of the axis of rotation of the rotor relative to the front section. As a preference, the drone is arranged in such a way that the movements orienting the axis of rotation of the rotor are effected about a center of rotation on which the universal joint is centered.

As a preference, the propeller and the rotor are moved by one and the same motor. The rotor may be driven via an epicyclic reduction gearbox.

The drone may comprise a rear section bearing the propeller, the rotor rotating between the front and rear sections.

As a preference, each wing is connected to the rotor by a mast comprising a joint allowing the wing to be folded against the fuselage during a phase of launch of the drone, when the latter is contained inside a launcher.

As a further preference, the drone comprises a mechanism allowing the hinge to be immobilized once the wing has deployed. This blocking mechanism may comprise a locking ring which in the locked position covers the hinge and thus immobilizes the mast in a configuration in which it is coaxial with the ring. An actuator housed in the wing may generate a relative movement between the mast and the locking ring to bring the latter into its blocking configuration.



The variation in incidence of the wing relative to the rotor can be obtained by a mechanism which converts a rotational movement of an actuator into an axial movement of the mast. The latter may comprise a first stud near to the actuator and a second stud near to the rotor. The two studs move together under the action of the actuator. The latter drives the rotation of a drive ring that has an axial slot in which the first stud is engaged. The first stud is also engaged in a helical slot of a tubular part fixed with the wing, secured to the locking ring. Thus, a rotation of the drive ring is accompanied by an axial movement of the mast relative to the locking ring and to the fixed tubular part. The second stud is engaged in a slot formed on a tubular part which is fixed on the rotor and which rotates therewith. This slot comprises a first portion which is linear and extends radially, and a second portion which is helical. When the mast moves axially, under the effect of the rotation of the actuator, the second stud moves along the linear first portion and then along the second portion. The first portion serves to lock the wing in the fixed-wing forward-flight configuration. The second portion allows modification of the incidence of the wing in the rotary-wing configuration, so as to vary the collective pitch.

Another aspect of the invention, independently of or in combination with the foregoing, has as its subject matter a launcher that can be used to launch a drone as defined above, comprising a cap able to house the drone, and four vectored-thrust boosters for orienting the launcher.

As a preference, the drone has folding wings that can be folded against the fuselage when the drone is contained inside the launcher.

As a preference, the cap comprises two articulated sections which are kept closed by the aerodynamic thrust when the launcher is moving at high speed.

As a preference, the drone comprises folding wings which can be folded against the fuselage when the drone is contained inside the cap.

As a preference, each booster comprises a deflector comprising a body able to pivot about a first axis of rotation, this body enclosing an element that is able to pivot about a second axis perpendicular to the first. The body may notably be formed of two units which are assembled around a toric section constituting said element.

As a preference, a system of redundant actuators provides control of the pivoting of the deflector about these two axes of rotation.

A modular unmanned aerial vehicle system VARIOCOPTER includes a fuselage module, a rotor module, and a wing module. The fuselage module comprises a flight controller and a power distribution device. The fuselage module is releasable attached to the rotor module or the wing module, and the fuselage module is releasable attached to the rotor module. The rotor module includes one or more motors and an electronic speed controller (ESC), while the wing module includes a wing having a flap, elevator, aileron, or rudder. The fuselage module, the rotor wing module and the wing module can form various unmanned aerial vehicle configurations. Each configuration has different advantages in time of flight, distance, battery life, and payload capability. The drone may be configured in a specific configuration to optimize parcel delivery.

Details of one or more implementations of the subject matter described in the disclosure are described in the drawings and the following description. Other characteristics, aspects and advantages of the subject matter will become apparent according to the specifications, drawings, and technical solution.

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