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## **CHOICE OF THE ADAPTIVE WING TYPE WITH FLEXIBLE MECHANISM**

The traditional design method of the wing is to optimize the shape of the wing in a flight state, and then to design the wing. However, this design method can only ensure the best performance of the wing in this specific flight state, and can not fully play the best performance of the aircraft, which has great limitations.

Therefore, for special purpose aircraft, in order to better reflect its optimal maneuverability, fuel efficiency and economic performance, we can adopt the design concept of adaptive wing. It can automatically change geometric parameters in flight according to the flight situation to obtain optimal performance, and the wing can be bent to the appropriate position as required.

In work the most sufficient components of the adaptive wing, such as flexible mechanism, flexible skin and wing frame were selected to analysis and to perform the choice of adaptive wing type.

To generate a lot of mechanical motion through the elastic deformation of part or all of its flexible members the flexible mechanism can be used. Compared with the traditional mechanism, the flexible mechanism has fewer components, can be designed as a whole, no need for assembly, no friction, wear and transmission clearance, small invalid stroke, can achieve high precision movement, improve reliability, and easy to manufacture.

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The adaptive wing needs to produce continuous deformation, so the skin should have the ability of continuous deformation to meet the deformation generated during deformation, and at the same time, it should have strong stiffness and strength to maintain the shape of the wing and transfer the load.

The wing frame is based on reconfigurable honeycomb core. The sandwich layer of honeycomb sandwich structure is a series of hexagonal holes made of metal material, glass fiber or composite material. The upper and lower sides of the sandwich layer are then bonded (or brazed) on the thinner plate. Honeycomb sandwich structure of light weight, rigidity, good stability, high strength, sound insulation, heat insulation performance.

At result, if the flexible mechanism is applied in the adaptive wing, the performance of the aircraft can be improved better. Large deformation of structure is realized by small denaturation. Thus, advanced composite materials should be selected for skin (such as silicone elastomers). The desire is to realize the topology optimization of reconfigurable honeycomb core, and select the optimal combination of various honeycomb forms according to different situations in various flight states of the aircraft.

Consequently, the comparing of the material elasticity, durability, air permeability of various frames and the matching of various materials with the aerodynamic characteristics of the wing when the wing is deformed should be held regularly.