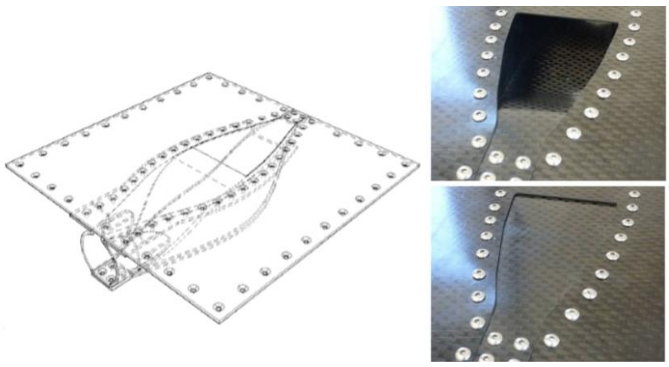
Morphing Air Scoop

A novel deployable bistable morphing structure



Morphing structures are structures that change shape or state in order to change their operating characteristics or as a response to changes in environmental conditions. Bistable structures are good candidates to be used as morphing structures because they have ability to remain in equilibrium in two predefined shapes. Actuation is required to transit, 'snap-through,' between these stable states.

The morphing air scoop essentially consists of three main components: A deployable structure that deflects the airflow into the aircraft, a tube-like component to manage the airflow inside the aircraft and a structure to integrate these two components into the aircraft skin. In its retracted state the air scoop must be as flush as possible with the external aircraft skin to minimise aerodynamic drag. The air scoop must be able to maintain this flush geometry whilst being subject to aerodynamic loads. Once actuated the air scoop must move into its deployed shape and remain in this state without further actuation. The basic principle could be applied to any bistable actuator for a variety of applications on land, sea or air.

Key Benefits

- 2 stable states (open and closed/flush)
- Does not require continuous actuation and can be lightweight, cheap and compact
- Fast deployment time <5s
- ± 10kPa dynamic pressure with deflections <±2mm
- -20°C to +90°C, Waterproof, 10 year life (5000 cycles)

Applications

- • Automotive—Ventilation, down force generation
- Deployable UAV engine air intakes
- Air intakes for aircraft cooling system

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