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A Stall Prevention and Recovery System For Airplanes

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OTHER INFORMATION

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- » **Transportation**
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BRIEF DESCRIPTION

Under stall conditions, some airplane control surfaces suffer from decreased or reversed sensitivity, making it difficult for typical control schemes to recover from the stall. UCI inventors have developed a novel roll mechanism, derived from geometric nonlinear control theory, which allows for pilot roll control and prevents unintentional roll motion resulting from the stall.

SUGGESTED USES

- » Stall prevention and recovery in aircraft

FEATURES/BENEFITS

- » *Better roll control:* Mechanism generates more than 4x the roll motion of other techniques
- » *Independent sensitivity:* The control sensitivity is unaffected by the stall condition
- » *Stall prevention:* The system uses angle of attack (AOA) estimations to prevent a pilot from causing a stall
- » *Minimal implementation:* The system would not require extensive aircraft modification

TECHNOLOGY DESCRIPTION

Airplane stall is a condition in which an airplane loses lift and control when airflow over the wings is disrupted. It accounts for almost half of loss-of-control events in commercial aircraft. During stall, the mechanical control surfaces on the wings of aircraft suffer from decreased effectiveness, leading to less pilot control and ultimately making it more difficult to exit the stall.

UCI inventors have developed a stall recovery flight control system (SRFCS) that ensures safe operation and recovery from stall or spin/stall situations with the aid of a novel mechanism to generate roll motion during a stall. The roll mechanism relies on a geometric control technique that manipulates both wing and tail control surfaces to generate rolling motion in situations where it would otherwise be impossible. The sensitivity of the geometric control technique is unaffected by the stall condition and can generate more than four times the roll motion of a typical control technique. The invention presents a stall recovery solution that, unlike previous solutions, is capable of operating safely near and during stall, increasing the chance of successful recovery.

STATE OF DEVELOPMENT

Concept was demonstrated using computer simulations and currently undergoing testing at the UCI wind tunnel. Flight demonstrations are in the initial planning stage.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,273,903	03/15/2022	2019-074

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