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A Hazard Analysis Based Approach to Improve the Landing Safety of a Blended-wing-body Remotely Piloted Vehicle

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Abstract

The BUAA-BWB remotely piloted vehicle (RPV) designed by our research team encountered an unexpected landing safety problem in flight experiments. It has obviously affected further research project for Blended-wing-body (BWB) aircraft configuration characteristics. Searching for a safety improvement is an urgent requirement in the development work of the RPV. Combining with vehicle characteristics, a new systemic method called System-Theoretic Process Analysis (STPA) has been imported to apply on the RPV flight experiment hazard analysis. An uncontrolled system behavior "path sagging phenomenon" is identified by implementing a 3 degree of freedom simulation based on wind tunnel experiment data and establishing landing safety system dynamics archetype, then a derived safety improvement requirement emerges. To obtain higher safety design effectiveness and considering safety design precedence, a new longitudinal control surface "belly-flap" is used to eliminate hazards in landing. Finally, Flight experiments show that the hazardous factor has been correctly identified and the landing safety has been efficiently improved.

Keywords: BWB RPV, STPA, sagging phenomenon, system dynamics, safety design precedence, belly-flap

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