PURDUE INNOVATES | Office of Technology Commercialization

Foldable Propeller Blade Structure

Compact, foldable UAV blades enabling storage, confined-space launches, and autonomous deployment.

Researchers at Purdue University have developed a novel foldable propeller blade design. Unlike conventional propeller blades, which are bulky and inflexible, these blades have the unique ability to be efficiently folded into small volumes for easy storage and transportation. In addition to easy storage, the compact design of the folded blades enables them to be deployed from tightly confined spaces. When packaged within small, standardized canisters for launching, aircraft with these innovative blades can be placed where they are needed, even in the smallest of locations, and launched remotely. Once launched, the blades deploy autonomously, making them perfectly suited for unmanned aerial vehicles, such as drones used in research, defense, and other disciplines.

Technology Validation:

Through folding and deployment experiments, researchers demonstrated that the proposed blades exhibit compliant post-buckling response that allows extensive folding and rapid unfolding behavior. Propeller thrust test results showed that the proposed blade retains sufficient stiffness in the pre-buckled state to resist aerodynamic loads and generates the same thrust performance as solid blades.

Advantages:

-Compact storage

-Portability

-Enables launching and take-off from confined spaces

-Blades deploy autonomously after launch

Applications:

-Aerospace engineering

Technology ID

2025-KWOK-70868

Category

Aerospace & Defense/Aviation/Components

Aerospace & Defense/Autonomous Systems (UAVs & AVs)

Authors

Kawai Kwok

Bowen Li

Annan Mashin

Further information

Matt Halladay

MRHalladay@prf.org

View online

-Defense

-Unmanned Aerial Vehicles (UAVs), such as drones

Publications:

Mashin, A., et al. "Harnessing instability for deployable propeller blades," Aerospace Science and Technology, 146, March 2024. https://doi.org/10.1016/j.ast.2024.108926.

TRL: 2

Intellectual Property:

Provisional-Gov. Funding, 2025-04-29, United States

Keywords: Foldable propeller blades,Deployable UAV components,Compact drone design,Aerospace propulsion innovation,Portable drone technology,Autonomous blade deployment,Small-space UAV launch,Aerodynamic blade performance,Defense drone technology,UAV payload optimization,Rapid deployment mechanisms,Lightweight aerospace parts,Remote launch UAVs,Advanced drone mobility