Layered Manufacturing for Research and Teaching

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Layered manufacturing (3D printing) is uniquely suited to aerodynamic research and teaching applications. Like traditional composite manufacturing, it can replicate the precise curves of aerodynamic surfaces, but without the need for expensive tooling. This is advantageous to research and teaching applications, where batch sizes often consist of only a few units. Without tooling, layered manufacturing also allows for much faster design prototyping and testing. High-end rapid prototyping machines show promise for small-scale propeller testing, where iteration times can be reduced from weeks to days. Propellers pose several unique challenges for layered manufacturing methods due to their complex 3D geometry and thin features. For less taxing geometries, such as small UAV fuselage components and aerodynamic fairings, desktop machines are shown to have potential applications. Additionally, several design advantages over composite parts are demonstrated, although weight and durability pose issues. Both high-end and desktop machines have promise for aerodynamics and aircraft design courses by allowing students to compare computational results with real-world tests.