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Abstract

This paper concentrates on the aero-elastic investigation of a morphing wing concept using a compliant membrane as lifting surface to allow large variations of the planform geometry (aspect ratio and sweep angle). The results of force measurements performed on five different wing configurations shows that varying the planform effectively alters the lift and drag characteristics in such a way that relatively high lift-to-drag ratios can be maintained over a broader range of flow conditions. Due to its intrinsic construction, the wing surface passively deforms under aerodynamic loading resulting in a pronounced dependency of the aerodynamic characteristics on the flow conditions. To provide insight into the complex flow-structure interaction mechanisms involved, the deflection of the membrane of two different wing configurations is measured at various flow conditions (dynamic pressures and angles of attack) using a stereo photogrammetry technique. The results highlight the broad range of airfoil shapes the wing can take on, depending on the flow conditions and on the wing planform.