The convective behavior of a dynamic stall vortex at low Reynolds number

JOHN HRYNUK, US Army Research Lab - Aberdeen — Dynamic stall is a fundamental flow phenomenon that is commonly observed in biological flight and rotorcraft. Under certain conditions a leading edge vortex forms generating large but temporary lift forces. A common assumption for the convective behavior of the dynamic stall vortex (DSV) is that it convects downstream after forming and diffuses while convecting away. However, experiments on a NACA 0012 full span wing at Reynolds number of 12,000 showed the dynamic stall vortex undergoing a behavior that did not resemble diffusion as it convected downstream. Instead, the DSV was observed to compress in a specific region downstream of the wing. A comparison between the DSV behavior and convection of bluff body shedding, which occurred after the DSV was no longer present will be shown. A better understanding of this vortex breakdown method for the dynamic stall vortex at low Reynolds number may help improve vortex methods and CFD for studying dynamic stall.

John Hrynuk
US Army Research Lab - Aberdeen

Date submitted: 31 Jul 2017