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New measure based solely on wake data for hovering performance SACHIN SHINDE, Indian Institute of Technology, Kanpur, India, JAYWANT ARAKERI, Indian Institute of Science, Bangalore, India — In case of hovering wherein forward speed (thus work) is zero, the conventional definition of efficiency does not hold; Figure of Merit (FM) is an alternative. However, both efficiency and FM require measurement of input power which is not trivial for hovering birds and insects. We propose a new measure, independent of measuring input power, called ‘jet effectiveness factor (Π)’ defined based on mass, momentum and kinetic energy flux data, essentially requiring only wake velocity field which can be gathered using PIV, MTV. Inverse of Π can be thought as efficiency. We theoretically calculate Π for two-dimensional (2D) rectangular, triangular and Gaussian jets as 1, 1.1250 and 1.1548 respectively. Closer the value of Π to 1, more effective would be the jet. From PIV experiments, we calculate Π for 2D reverse Karman jet generated by flexible foil flapping in an otherwise quiescent ambient - situation relevant to hovering, and show that the value of Π is close to that for Gaussian jet for several cases obtained by varying pitching amplitude and frequency. This new measure can be extended to calculate effectiveness of jet generated by MAVs, AUVs and cruising fish, birds, insects where measuring input power is non-trivial.

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