Document details

‹ Back to results | 1 of 1

Export Download Print E-mail Save to PDF Add to List More... ›

View at Publisher

Journal of Aerospace Technology and Management Open Access
Volume 11, 2019, Article number e1719

Effects of bio-inspired surface roughness on a swept back tapered NACA 4412 wing (Article) (Open Access)

Malik, K., Aldheeb, M., Asrar, W., Erwin, S.

International Islamic University Malaysia, Kulliyyah of Engineering, Department of Mechanical Engineering, Kuala Lumpur, Malaysia

Abstract

View references (22)

This paper presents the overall pros and cons of the effect of surface roughness elements over a NACA 4412 tapered, swept back half wing with a sweep angle of 30° and a dihedral angle of 5°. The tests were conducted at a Reynolds number of 4×10^5 in the IIUM Low Speed wind tunnel. Different roughness sizes and roughness locations were tested for a range of angle of attack. Lift, drag and pitching moment coefficients were measured for the smooth wing and with roughness elements. Surface roughness delays the stall angle and decreases the lift. The wing with the roughness elements located at 75% to 95% of mean chord from leading edge shows minimum drag and maximum lift compared to other locations. Significant increase in the pitching moment coefficient was found for flexible roughness elements. In case of rigid surface roughness, the effect on pitching moment is small.

SciVal Topic Prominence

Topic: Wing | Wings | Flapping flight

Prominence percentile: 86.545

Author keywords

3D wing aerodynamic coeffi cients | Bio-inspired roughness elements | NACA 4412

Indexed keywords

Engineering controlled terms: Angle of attack | Dihedral angle | Drag | Reynolds number | Swept wings | Wind tunnels

Engineering uncontrolled terms: 3D wings | Low-speed wind tunnel | NACA 4412 | Pitching moment coefficients | Pitching moments | Roughness elements | Roughness size | Stall angles

Engineering main heading: Surface roughness

ISSN: 19849648
Source Type: Journal
Original language: English
DOI: 10.5028/jatm.v11.1021
Document Type: Article
Publisher: Journal of Aerospace Technology and Management

References (22)

View in search results format >

All | Export | Print | E-mail | Save to PDF | Create bibliography

1 Bartenwerfer, M., Bechert, D.
Viscous flow on hairy surfaces
(1991) *Zeitschrift Fuer Flugwissenschaften Und Weltraumforschung*, 15, pp. 19-26. Cited 7 times.

2 Bechert, D.W., Bruse, M., Hage, W., Meyer, R.
Fluid mechanics of biological surfaces and their technological application
(2000) *Naturwissenschaften*, 87 (4), pp. 157-171. Cited 245 times.
link.springer.de/link/service/journals/00114/index.htm
doi: 10.1007/s001140050696
View at Publisher

3 Carruthers, A.C., Walker, S.M., Thomas, A.L.R., Taylor, G.K.
Aerodynamics of aerofoil sections measured on a free-flying bird
(2010) *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 224 (8), pp. 855-864. Cited 28 times.
doi: 10.1243/09544100JAERO737
View at Publisher

4 Chakroun, W., Al-Mesri, I., Al-Fahad, S.
Effect of surface roughness on the aerodynamic characteristics of a symmetrical airfoil
(2004) *Wind Engineering*, 28 (5), pp. 547-564. Cited 16 times.
doi: 10.1260/0309524043028136
View at Publisher

5 Chen, J., Xie, S., Li, H., Luo, J., Zhao, C.
Roughness effect on airfoil aerodynamic performance for land-yacht robot
(2016) *Journal of Renewable and Sustainable Energy*, 8 (2), art. no. 025701. Cited 4 times.
http://scitation.aip.org.ezproxy.um.edu.my/content/aip/journal/jrse
doi: 10.1063/1.4941794
View at Publisher

6 Crandell, K.E., Tobalske, B.W.
Aerodynamics of tip-reversal upstroke in a revolving pigeon wing (Open Access)
(2011) *Journal of Experimental Biology*, 214 (11), pp. 1867-1873. Cited 30 times.
http://jeb.biologists.org/content/214/11/1867.full.pdf+html
doi: 10.1242/jeb.051342
View at Publisher

7 Ennos, A., Hickson, J., Roberts, A.
Functional morphology of the vanes of the flight feathers of the pigeon Columba livia
(1995) *Journal of Experimental Biology*, 198, pp. 1219-1228. Cited 34 times.