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## UIUC Propeller Data Site

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This webpage includes wind tunnel measurements for propellers used on small UAVs and model aircraft.

The propeller database includes two volumes:

- [Volume 1](#) - UIUC MS thesis by John Brandt and following tests (2005-2008). Refs 1 and 2. *Last updated 2/3/15 (ver 3).*
- [Volume 2](#) - UIUC PhD dissertation by Robert Deters and following tests (2009-2015). Refs 3 and 4. *Last updated 5/27/15 (ver 1).*

### Basic Relations

The UIUC data use the standard definitions for propeller aerodynamic coefficients:

$$\begin{aligned}
 J &= \frac{V}{nD} & C_T &= \frac{T}{\rho n^2 D^4} & C_P &= 2\pi C_Q & \eta &= \frac{C_T J}{C_P} \\
 C_P &= \frac{P}{\rho n^3 D^5} & C_Q &= \frac{C_P}{2\pi} & \eta &= \frac{TV}{P} \\
 C_Q &= \frac{Q}{\rho n^2 D^5} & n &= \text{revolutions per sec}
 \end{aligned}$$

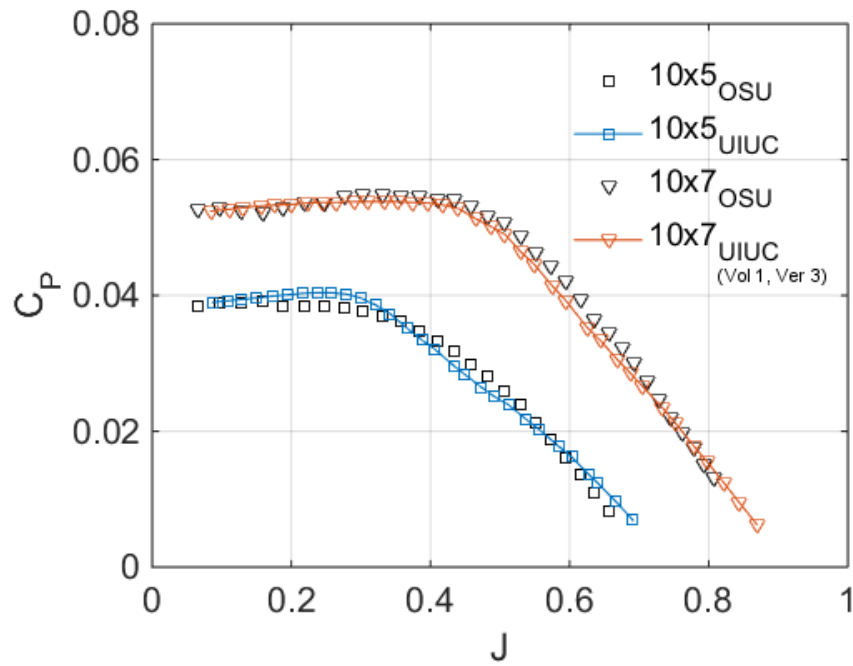
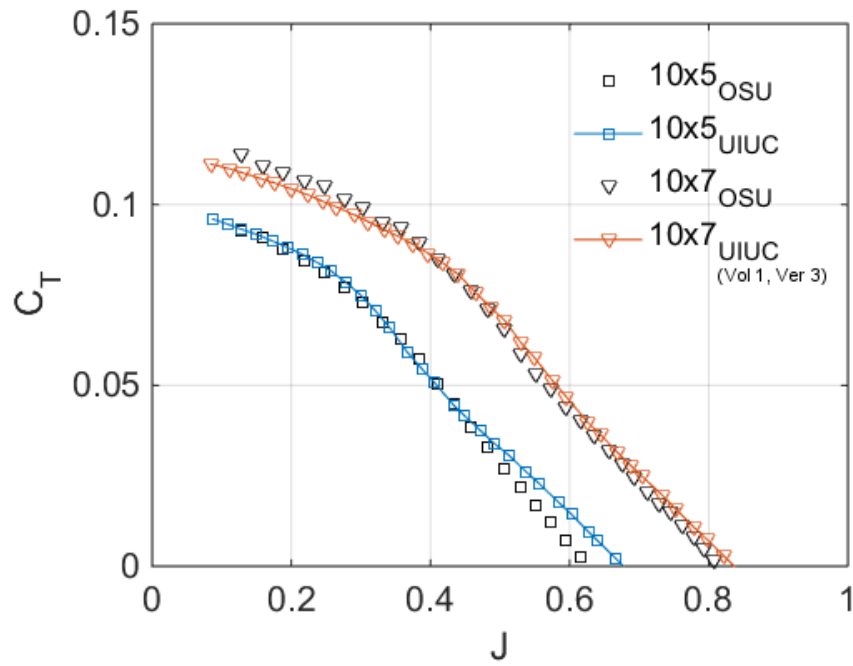
For more information, a useful reference is:

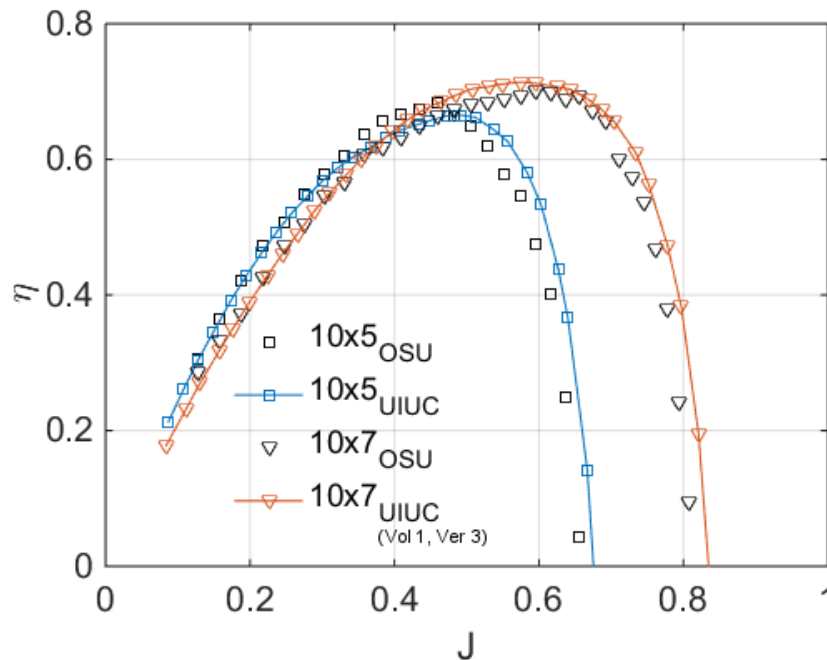
McCormick, B.W., "Aerodynamics, Aeronautics, and Flight Mechanics," Wiley, Second Edition, 1995.

### Propeller Measurements Comparison - UIUC and Ohio State University

The figures below show a comparison between [UIUC Volume 1 \(V3\)](#) data and measurements taken at Ohio State (Ref 5). The results show good agreement, especially considering that the thrust and torque measurement techniques differ. For the UIUC data, the thrust is measured directly with a load cell attached to a pivot arm. The torque is measured through a torque cell attached to the fixture that holds the motor. For the OSU data, the measurements were taken using a multi-axis load cell attached directly to the motor (Ref 6).

**APC 10x5E and 10x7E "thin electric" propellers.**





Additional formats: [.eps](#), [.fig](#), and [.pdf](#)

Credits: Graphics provided by Matthew McCrink and James Gregory, Ohio State University, June 2015.

## Citation

Recommended way to cite this webpage in a publication:

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## Download Archive

Download the entire propeller database: [UIUC-propDB.zip \(32.9 MB\)](#)

## References

1. Brandt, J. B., "Small-Scale Propeller Performance at Low Speeds," M.S. Thesis, Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, Illinois, 2005.
2. Brandt, J.B. and Selig, M.S., "Propeller Performance Data at Low Reynolds Numbers," *49th AIAA Aerospace Sciences Meeting*, AIAA Paper 2011-1255, Orlando, FL, January 2011.
3. Deters, R.W., Ananda, G.K., and Selig, M.S., "Reynolds Number Effects on the Performance of Small-Scale Propellers," *AIAA Aviation and Aeronautics Forum and Exposition (Aviation 2014)*, AIAA Paper 2014-2151, Atlanta, GA, June 2014.
4. Deters, R.W., "Performance and Slipstream Characteristic of Small-Scale Propellers at Low Reynolds Numbers," Ph.D. Dissertation, Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, 2014.
5. McCrink, M.H. and Gregory, J.W., "Blade Element Momentum Modeling for Low-Re Small UAS Electric Propulsion Systems," *AIAA Aviation and Aeronautics Forum and Exposition (Aviation 2015)*, AIAA Paper 2015-3296, Dallas, TX, June 2015 | <http://arc.aiaa.org/doi/abs/10.2514/6.2015-3296> | Also see <http://arc.aiaa.org/doi/abs/10.2514/1.C033622>, 2016.
6. Gregory, J.W., private communications, June 2015.

## Release Notes

- 11/29/15 - Added a link to download the entire database as a zip file.
- 11/29/15 - Started these release notes. Separate release notes are included with the Volume 1 and Volume 2 datasets.

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