TEACHER INFORMATION

Air Resistance

1. The student pages with complete instructions for data collection using LabQuest App, Logger *Pro* (computers), DataQuest (TI-Nspire Technology), EasyData or DataMate (calculators), and DataPro (Palm handhelds), can be found on the CD that accompanies this book. See *Appendix A* for more information.

2. Larger food-service size coffee filters of roughly the same proportions as consumer basket style coffee filters are available. Try to get some of these from a restaurant or your cafeteria. They make great demonstration devices.

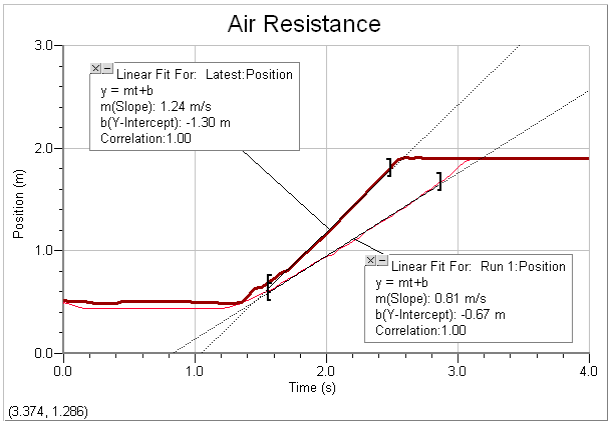
3. There are numerous articles on the physics of air resistance. Two references from The Physics Teacher are "Modeling Air Drag," by Christopher Brueningsen, et al., Volume 32, October 1994, page 439 ff, and "Effects of Air Resistance," Vasilis Pagonis, et al., Volume 35, September 1997, page 364 ff.

4. Students need to recognize that during free fall the drag force is equal to the weight of the filters; therefore, the weight of the filters or number of filters equal drag force during terminal velocity. Best results are obtained by allowing the filters to fall a long distance. Consider having the students stand on a chair when releasing the filters. Release the filters from underneath, and don't hold them from the side to avoid getting a reflection from the hand.

5. Motion detectors without a mode switch do not properly detect objects closer than 0.45 m. As a result such motion detectors must be farther away from the experiment than described in the student notes. In contrast, Motion detectors *with* a mode switch will detect objects as close as 0.15 m. Ideally, an experiment will be set up so that the target is nearly this close at the point of closest approach, giving the best possible data.

SAMPLE RESULTS

Number of filters	Terminal Velocity v_T (m/s)	(Terminal Velocity)^2 v_T^2 (m^2/s^2)
1	0.80	0.65
2	1.12	1.25
3	1.37	1.88
4	1.57	2.46
5	1.87	3.50
6	2.02	4.08
7	2.23	4.97
8	2.34	5.48



Typical position vs. time graphs

ANSWERS TO PRELIMINARY QUESTIONS

For Sample Answers to the questions in this lab, please contact Vernier Software and Technology at swnanswers@vernier.com

ANSWERS TO ANALYSIS QUESTIONS

For Sample Answers to the questions in this lab, please contact Vernier Software and Technology at swnanswers@vernier.com