iFLY Education Program
Missouri High School Standards Alignment
https://dese.mo.gov/college-career-readiness/curriculum/missouri-learning-standards#mini-panel-mls-standards3

Field Trip Activity	Standard
Interactive Presentation: • Students analyze the graphs of displacement, velocity, and acceleration vs. time and use these to describe a skydiver during freefall • Students predict, observe, record and analyze the velocities of different objects in the wind tunnel. • Use a free body diagram of a skydiver to sum the forces acting on his/her body • Discuss that when forces are balanced (net force = 0), acceleration is zero, and a skydiver achieves “terminal velocity” • Discuss the differences between objects falling through air vs. a vacuum. Conclude that in a vacuum, mass has no effect on acceleration or velocity. • Discuss the difference in frames of reference between the wind tunnel and skydiving, i.e, in the wind tunnel the flyer is still and the air is moving, while in free flight the air is still and the skydiver is moving • The STEM Educator leads the class in the derivation of the equation for terminal velocity using the balance of forces equation (sum of forces = ma) • Students identify the independent variables involved in terminal velocity, and determine whether they are inversely or directly proportional to velocity • Identify when the gravitational force or the force of air drag is dominant. Discuss the effect this has on a skydiver’s velocity and acceleration. • Educator leads a discussion about engineering careers, the engineering process as applied to the design of iFLY tunnels, and other applications of wind tunnels in STEM	9-12.PS2.A1 9-12.PS2.A2

LAB ACTIVITY • Students break into small groups and brainstorm ways to measure the variables required for solving the lab activity • Students use the derived equation to calculate their own personal terminal velocity in the wind tunnel, which they compare to actual values • Students measure their own mass and frontal area using scales and tape measures. They use this to calculate their terminal velocity in the tunnel. All calculations are made using SI units. • Students compare predicted terminal velocity to their actual velocity in the wind tunnel and calculate percent error. They then discuss possible reasons for error and ways to redesign the experiment to be more accurate. • Students use the equation for terminal velocity to conclude what would happen if certain variables were increased or decreased. For example, “How would a very large object with a small mass behave in the wind tunnel?” • Apply the equation for terminal velocity to such hypothetical scenarios such as “What would you expect for a skydiver falling through molasses instead of air?” or “What factors complicated the design of the descent and landing for the NASA Mars Rover expeditions?”	9-12.PS2.A1 9-12.ETS1.A.2 A1.NQ.B.3 A1.CED.A1, 2 and 4 A1.REI.A.1 A1.REI.B.3 G.GMD.B.3 G.MG.A.1
Post-field trip classroom activity • Students can use their own data to create a class graph of terminal velocity. • Students can use their class graph to create a “recommendation” to iFLY engineers for which value of drag coefficient should be used to model teenage flyers in the wind tunnel	9-12.PS2.A1 A1.DS.A.1