Hello iFly Guest Lecturers,

This note is long, but please read through it and respond. I am trying to be as thorough as possible. If you have any questions that this doesn’t answer, please ask! Also, if I have not heard from you about availability, please let me know if you are still interested in lecturing. Thank you!

I know this is late in coming, but I have attached a typed version of the notes I use during my lectures. I hope the file is not too large. I have also included this letter as an attached document to go with the lecture notes. I do not say or write absolutely everything in my notes during the lecture, nor do I always go in this exact order, but it is a pretty good guideline for what I cover and how I try to work from one concept to the next. Please take a look at the notes, and think through for yourselves how you would approach each topic and explain it to the different ages. Possible course levels include 5th or 6th graders, 8th grade physical science, 9th grade integrated science, 11th and 12th grade regular physics, AP physics B (all topics, no calculus), and AP physics C (mechanics with calculus), and various levels of college physics. The level of science you will be teaching should be with the information connected with the date of the program. Some class levels I know more about than others. There is always a need to feel out the group when you meet them so that you know you’re speaking to their level of understanding.

I always keep the lecture simple and conceptual even if they have covered the topics in their classes already, however, if you see a need for a more technical explanation (with the AP physics C students who are learning mechanics with calculus, or the college students, for example) then feel free to teach from your wealth of knowledge. Please be careful not to go over their heads though. If you have an idea for making the lecture more interactive, feel free to try it and let me know how it goes. Please just remember that you only have about 25 minutes to cover all of the topics, and that the point is to get the students thinking about the basic concepts and how they relate specifically to their body flight experience and the operation of the tunnel so that the rest of their experience at iFly is a little more consciously educational.

I would greatly appreciate if you would share with me how you teach the lecture. (If you come up with different analogies, or ways of explaining things, or are asked about a topic that is not currently included in the lecture, etc.) I would like to hear about what worked for you and what didn’t. I am always looking for ways to improve the program, and your ideas can help.

I understand that it is unusual, and may be unnerving that all of you will be teaching your first times without me there to oversee things. I trust your abilities to communicate an excitement for the science of body flight and the tunnel and to speak to the various students’ levels. I will be getting feedback from the teachers and hopefully from you all as well to see how it goes. This is why I am trying to be as thorough as possible with my explanation of your duties, but things will always come up. One of the keys with this program is that you often have to go with the flow. When things come up, the flight staff at iFly are very good at making things work with a little bit of flexibility.
PAYMENT
Your pay will be $30 an hour in flight time at iFly SF Bay. Please be sure to record the hours you work in preparation for the lecture, as well as the time you actually spend at iFly teaching. Please record the date and hours that you worked, as well as a brief explanation of what you spent the hours doing. Each of you will need to fill out a form with our grounds crew manager, Emiko, in order to get paid.

THE LECTURE
The lecture is taught in the conference room on the second floor next to the flight chamber (ask where that is). Have the students pull the conference room chairs around the table so they are all facing the white board. Any extra students can bring in red chairs from the viewing area or sit on the counter by the window. The white board markers are sometimes hard to find, so do your search before the students arrive. They are often hidden in a black computer stand (or something like that—I’m not exactly sure what the thing is called) that is usually sitting on the counter. The lecture should take 20-25 minutes. From the lecture, the group will go to the tour next (usually—as I said, sometimes things get rearranged). If there is only one lecture to teach, you may follow the group on the tour if you are interested. Otherwise, you are finished and may go home. If the group is large, it will be split up into multiple groups and will rotate through the program. You will then need to stay and teach the lecture to each group as they are sent to you. There is usually at least one rotation during which no lecture is being taught, so don’t worry if you don’t always have students.

IFLY CONTACTS
In case you need something, please e-mail or call these people. They do not all work every day, so send an e-mail to them all, and hopefully someone will get back to you. Please copy me on your e-mails too, so I have a record when I return. If you all don’t mind, I would like to give you all each others’ contacts as well, so that if something comes up, you can find your own replacements. Please let me know if that’s ok.
Emiko Taylor, grounds crew manager, emiko@iflysfbay.com, 510-489-4359
Travis Richards, flight crew manager, travis@iflysfbay.com, 510-489-4359
Amerae Bergado, groups coordinator, amerae@iflysfbay.com, 510-489-4359 ext. 204
Rosa Alva, iFly Hollywood director of education, education@iflyhollywood.com
(Cailin Creighton, iFly SF Bay program director, cailin@iflysfbay.com)

THE EXPERIMENTS
Please also be active in the experiment portion of the program. The experiments should happen first and with the whole group. A storage bin of various sports balls and more oddly shaped items is kept above the flight suits—a flight instructor can get it down. The metal bowl should be filled with water, they should know that, but in case they don’t you now know it too. There is one flight instructor in particular, Brian, who often takes charge on the experiments, but he may already be in Montreal when you are working. If someone takes charge, that’s fine, if not, you should. The probability is that you will be taking charge on the experiments. A flight instructor will suit up and conduct the
experiments in the wind tunnel, but the more interactive the experience is, the better for the students.

Two things help make it interactive. First, before the flight instructor enters the tunnel with the items, we take five items from the bin and have the students guess which items fly most stably, and which items fly most erratically. The items are usually:

1) **A squishy ball with tentacles** (flies most smoothly, although it looks funny. It is very interesting to watch all the flexible tentacles constantly adjusting to the wind, keeping the center of the ball very stable);

2) **A tennis ball** (quite stable. The fuzz on the ball acts like a miniature version of the tentacles on the squishy ball, but the little ridges around the ball do affect its flight a little. Its flight speed is pretty fast);

3) **A plastic spider** (decently stable when upside down. They often don’t guess it, but it actually imitates the desired body position when belly flying—an arched back—so it is quite stable with its legs upwards and it will always flip over into that orientation);

4) **A wiffle ball with holes on only one half** (not stable. The wind is constantly catching the inside of the ball, and makes it either spiral, or flip back and forth);

5) **A football** (generally least stable, unless spun. If it is spun horizontally, it will fly fairly stably until it hits the wall and wigs out—it is then very hard to catch. The football is also an excellent way to demonstrate the importance of surface area presented to the wind in keeping you elevated. If the wind is flying the football horizontally, then if the flight instructor drops it when it is oriented vertically, it will fall to the net because the presented surface area is smaller and the wind speed is no longer fast enough).

Secondly, it helps to have someone speaking with the students while the flight instructor is conducting the experiments in the tunnel. Encourage them to think about what they are seeing. Often the flight instructors will get the balls back if they go too high by standing underneath them. The balls then drop right into their hands. They can also steer the balls by placing their arms underneath and to the side of them. The balls then ride the cone of air that is deflecting around the arm and fall towards the arm. They use these techniques when keeping people safe in the tunnel too. Also, have the students take note of the various wind speeds (terminal velocities) for the items in the tunnel. The wind speed in mph is always being shown on the monitor above and to the left of the wind tunnel. When the flight instructor gives his flying demonstration, note what he is doing with his body to create the movement. This will be easier if you have some flying skills yourself, but you can also just be observant. Here’s a quick lesson: up (extend arms and legs); down (lift up chin and arch back); forward (arms in, legs out); back (arms out, legs bent); right (right knee down, arms to the left); left (left knee down, arms to the right); spin (tilt arms or legs to catch more air on one side or the other). To complicate things all these moves can be done with arms only, with legs only, and in a variety of ways, but that’s the general description of moving precisely in the tunnel.
Thank you in advance for your enthusiasm and energy in teaching the lecture and leading the experiments. You will find my lecture notes in the accompanying document.

IMPORTANT THINGS TO REMEMBER AND GET ACROSS DURING THE LECTURE:
• You don’t have to say or write everything in my notes during the lecture, just cover the main topics simply and clearly. I apologize if anything in my notes is not accurate. Feel free to let me know that. Also, please excuse my diagrams— I am clearly not a computer wizard.
• The goal is to relate every topic directly to body flight (the simulation of terminal velocity) or the operation of the tunnel. The two most important topics are grasping what terminal velocity means in terms of forces, acceleration, and velocity and understanding how mass flow explains how the tunnel works.
• The tunnel simulates terminal velocity. The forces on you in the tunnel are the same as when you are at terminal velocity in the sky while skydiving. But your velocity towards the ground is different. In both cases $F_{air} = F_{grav}$ so no net force and no acceleration, but while skydiving you have velocity towards the ground as you fall through the air and in the tunnel we send the wind passed you instead.
• We recirculate the air in our tunnel. The fans are at the top, not the bottom. (You can have them hypothesize about that first. The early tunnel designs did have the fans at the bottom and didn’t recirculate the air.) We use a simple constriction to get the air as fast as we do. Our tunnel is more efficient than the early tunnels.