Team 1

Team *Panic! at the Cantina* was productive, efficient, and successful in all our work this semester by prioritizing organization, planning, and communication. While we did have unexpected challenges, we were able to quickly work together to overcome them. We stuck to our Management Philosophy -- “stay ahead of our work to avoid cramming and careless mistakes close to deadlines” -- and it saved us time, money, and stress throughout the project. Our advice to future teams is threefold:

**Communicate, communicate, communicate!** Every team, no matter how skilled the individual members are, is limited by the quality (and amount) of its communication. Your first priority when you meet you group for the first time should be to find a way for everyone to reliably reach everyone else, all the time. Trade numbers and set up a group chat (Slack and GroupMe are fantastic), because it's always helpful to see what other people in your team are talking about, even if you're not part of that conversation. If someone has something come up and can't make a meeting, the team will always benefit from knowing. And remember that this is a group project -- if you don't have an answer, one of your teammates might!

**Delegate responsibilities ahead of time!** Before anyone starts working, figure out what everyone is going to do. This goes for the BalloonSat, as well as any documents, reports, or presentations. It helps to have consistent roles throughout the semester: if one person is responsible for the Mission Statement and Mission Overview on the first presentation, that person should at least be involved in those responsibilities for the rest of the semester. Make sure everyone who is working on the same smaller team is working together, and be sure to communicate among the separate groups. *Panic! at the Cantina* discovered that it was always helpful to have at least one “expert” in a role working with one or two team members who were interested in learning that role. But remember that’s it’s also best to spread the experience. As the saying goes, “too many cooks spoil the broth.” It’s much more helpful for a few team members to work on each subsystem and keep the rest of the team apprised of their progress, than it is for the whole team to crowd around a single responsibility.

**Always be aware of deadlines!** Time is not your friend. When you start the semester, Launch Day might seem like a long way off. It isn’t. Don’t let the “slow” countdown lull you into a false sense of security. As long as you keep track of everything you have done, are doing, and will have to do, you will have no trouble staying on schedule. Aim to have your testing done two weeks before launch, and know you won’t. Something will come up that you hadn’t anticipated: maybe the sensor that your whole experiment hinges on fails at low pressures, or maybe your heater circuit is faulty and needs rewiring. Whatever it is, it will take time to fix and re-test. Budget time for the unpredictable surprises that testing will reveal.

All that having been said, **Don’t Panic!** As long as you stay aware of all the challenges you face, and leverage your team’s strengths to strategically conquer your obstacles, you will have the time, skills, and resources to succeed. Good luck, and **may the force be with you!**

Team 2

Dear Future Gateway to Space Students,
Congratulations on choosing this class! It’s going to be one of the hardest classes that you’ll ever take. But - don’t worry, it’s also going to be the most fun! You’ll learn a lot of stuff in Gateway, not just about space and spaceflight, but also about teamwork and group dynamics. This part doesn’t have to be any more difficult than you choose to make it. Here are some tips that should help out a lot:

1) When designing your experiment, make sure that it is specific enough to be testable. Do something that’s complicated and interesting, but also make sure that you can actually accomplish it in the given timeframe. This balance is hard to work out, but it is certainly possible, and you will benefit from falling right inside those bounds.

2) Figure out your design early. Then, do thorough research about your parts. Know all dimensions, weights, functions, interfaces, and nominal operation of everything before you finalize your design. Ensure that those functions match the bounds of your experiment (e.g. your pressure sensor functions as low as 1.12 kPa). Make sure that your parts are robust. For example, if you get a 9 degrees of freedom sensor, get the $50 unit that will always work instead of the $10 unit that will break after two days.

3) Do everything early, and devote as much time as you need to doing it. This cannot be stressed enough. Your whole team may not be able to show up to every (or, really, any) meeting, so just have meetings with as many team members as possible. Set goals to complete work as many days in advance as is feasible, and then try to actually meet those goals. It may seem like more work than absolutely necessary, but just remember that the stress of doing everything at the last minute is many times worse than the stress of going to all of those meetings.

4) In the same spirit as the above, give the machine shop staff plenty of time to fabricate any parts that you may want them to make. Give them at least two weeks lead time - remember, you’re not the only one using their services. The same thing goes for asking for help from the ITLL staff. It may take a couple of days to figure out your problem, so make sure that any delays caused by this will not impact your project.

5) Know the limits of your hardware. For example, an Arduino Uno can’t run a software serial without interfering with servo outputs due to the nature of the hardware using (specifically, a single timing circuit on the Arduino).

6) If possible, have several team members attend training sessions at the ITLL for the various skills you might need to complete your project (machine shop training, Solidworks modeling, etc.). This way, you will always have someone who can work on whatever needs to be done.

Remember these tips, and actually apply them. You may want to skimp on them, cut some corners, maybe save a little work time. You will not save work time. You will only hurt your project. Do everything early, do everything well, and you will have the most fun class of your life. Don’t do this, and it could turn into a nightmare. This isn’t meant to scare you, but rather to show you the best practices to make sure you will remember Gateway as the best class you ever took. Have an awesome semester!

Sincerely, Gateway to Space Spring 2017 Team 2 “Dancing With The Stars”
Team 3

Team AREA 52 wants the teams of next semester to know that this class will be more work than expected. Start working early, or the week before launch will be the worst week of your life. That week will be hell anyway (we promise), so don’t make it any worse for yourself. More hours will be spent on this project than on any other class. There will be long, frustrating nights, many failures, and few successes. However, despite all of this, it will be the most rewarding class of the semester. This class will be incredibly fulfilling and at the end, each team will finish the class knowing they’ve done something most students never get to do. This class provides students with an amazing opportunity to challenge themselves to accomplish something incredible. It will be difficult and stressful, but above all, it will be worth it. Also, do not under any circumstances buy sensors from China. They either won’t work or they will take a month to ship. In addition, make sure you take lots of pictures and videos before launch day so you have material for a team video at the end of the semester. Good luck!

Team 4

Not everything is going to work the first time. A lot of your time will include debugging and re-assessing certain mechanical and electrical components, but just make sure to stay patient and trust the process. Try your best to stick to the schedule, and definitely make sure to enforce a strict meeting schedule, as this is when you will get most of your work done. All things said and done, enjoy every moment. It is an incredible experience and you will make incredible relationships.

-- Justin

This class is a substantial amount of work, but as long as you schedule at least a couple of meetings each week, you and your team will be fine. It is also important to have a game plan set up before each meeting so you know exactly what you need to get done in the time you have. Often times we would have four hour meetings that we did not accomplish all the things we needed to because we did not plan our time well. But altogether, we learned how to work together and accommodate all the skills of the people on our team. I have spent more time with my team than I have spent with anyone else this semester and I would not have it any other way. These people are some of my closest friends. -- Bella

An amazing class for people who want to make something entirely by themselves, and is quite challenging because of it. You have to be dedicated to whatever job you are assigned, because you are going to spend a lot of time on it either way so it is easier to do an excellent quality job of it. It is awesome to get back data and footage from something you built, so it is definitely worth sticking till the end for. Also, Chris has done this quite a few times so it is good to listen to any tips he might have. -- Ash

If you really want to succeed in this class, you will.
If you really want to have fun in this class, you will.
If you really are not interested in this stuff…

...please leave the damn spot open for someone who is.
Be prepared to fail, because you will learn and get smarter.
Be prepared to struggle, because nothing worthwhile in life comes easy.
And be prepared to do some of the coolest hands-on science you have ever done…

...because it is your personal chance to go to space.

And when you are there, do not just look at Earth. Look to the stars.
Because that is where you are headed next. --Frasier

This class is the most rewarding class I have taken so far. I have learned more than I ever thought I would in this class. You get out of this class what you put into it. Either way it will make your life extremely stressful. This class also requires a lot of work. I would say about 6-10 hours a week and that is if nothing goes wrong, but something will go wrong and it will probably happen the week before launch. Despite all of this watching your payload drift away on the string is one of the best feelings you will have, even if you fail. This class will be the most rewarding class you will take as long as you participate in the class. --Conner

The class was easily my favorite class throughout my entire freshman year. This class will test your ability to push through any obstacles you face, force you to stay motivated towards your end goal, and most likely make you want to have some minor stress-induced freakouts. It sounds scary but trust me, if I could retake this class again, I would, except I would work on the BalloonSat more often and have it finished way before the deadline because something will fail on you the week of launch. Chris has opened my eyes to a new pathway that suits me, and has sparked new interests in myself. My group has become some of the closest friends that I have created, and it is unfortunate that I will not see them some time. Cherish every funny class lecture, every music filled team meeting, every team dinner or bonding time, and every headache you get along the way because that is how you get better. Make it to the end, make it to the edge of space, it will be the happiest moment when you realize that you created a box with your hands that went about 100,000 feet above you, even if it did not completely work.
P.S. Your upcoming years at college are going to be dreadful (or so I heard), so enjoy it now. Also, when Chris says you should work at least 6 hours a week so you do not get overwhelmed, do not do it. Hammer out like 9 hours so you can build that box and type those documents. --Nathan

Things are going to go wrong. Let us just get that out of the way. Plan for that, deal with it, stay patient, and this class will be among the most rewarding things you will do at CU. This is likely your first small contribution to the future of aerospace, so be sure you do not lose sight of your long-term goals amidst the minutiae. And be sure to have fun! --Sara

Team 5

If we could tell next semester’s class a hint to make life easier, it would be communication. Communication is essential to success. A team must be organized and its members must communicate in order to be maximally effective. Our team had trouble with communication early on, but once we were able to communicate better as a team we accomplished significantly more. A
last piece of advice would to not slow down if you’re ahead. It’s easy to become complacent if you are already ahead of schedule. It is important your team not lose focus and is able to continue working. Other than that, the only advice we can give is to have fun. The time goes by significantly faster and you do better work if you truly enjoy the work you’re doing.

Team 6

Listen to any feedback that Chris gives you about the schedule you make in your proposal, and use that feedback. That schedule will keep you on track and balance the workload. The workload graph that Chris shows you on the first day is fairly accurate. If you make sure to work a consistent 6 hours per week (that goes for every team member) and stick to the schedule, you will find there is never too much work at one time. You will run into unforeseen problems that will take much longer to fix than you will anticipate. You will have to redo tests. You will have to put in more time when needed to keep to that schedule. However, if you work hard to catch up when problems arise you will do just fine. Don’t worry about your grade as long as you put in the work, just stick to what you need to do and you will be fine. This is one of the most amazing experiences you can have: you get to send something to space! Just keep at it, it’s all worth it after launch day!

Team 7

Dear future Gateway to Space students,

Gateway to Space is very challenging and will take a lot of dedicated time with your group. Expect to spend a lot of your time working with your group and plan to stay ahead of the schedule. It is very easy to fall behind schedule; what you put into this project is what you will get out. Begin to build a schedule and get started on things early on. If you stay ahead of the schedule you will be rewarded later when launch is just around the corner and your group does not have to stress about last minute adjustments. Everything needed to finish takes a lot of time and is not something you can put together last minute.

This class really is a rollercoaster; do not expect it to be easy. There are lows and there are highs, but at the end of the semester you will be rewarded when you analyze your data and put together your video. Although there are moments where you feel overwhelmed, you will realize all the hard work has paid off and it will make it all worthwhile. We failed to complete a pressure test prior to launch which could have benefited our understanding of how our data was going to look after the flight. Therefore, it is very important that you make sure to complete all your tests prior to launch.

This class is a great opportunity which many people do not receive, so take advantage of it. Have fun with it. This class will test your critical thinking skills, but the amount of knowledge you will acquire during this class will benefit you down the road more than you know.

Team 8

There were a few things that Team Wilderness Explorers did that worked very well. The first one was using a cube shape for the BalloonSat which was very simple and very effective. Secondly, having a piece of foam core on the inside of the cube, separating the BalloonSat into
two levels, proved to be a very effective way to gain more space for batteries and components within the BalloonSat, while also making cable management much more simple. Another important thing to do is to make sure that you are fully aware of how every component works. For example, Team Wilderness Explorers’ heater was only designed to last an hour, but the team was not aware of this, and tested it as if it would last over two hours, which lead to a lot of wasted time and failed tests. Additionally, Team Wilderness Explorers would change the type of test tubes that the team used. The type of test tubes used by Team Wilderness Explorers used required two different tube sizes to be used for the control bacteria and for the bacteria surrounded with Hyaluronic Acid. The team did not realize that the different sized test tubes would cause changes in the growth rate over such a short period of time, but unfortunately it did. So make sure that any bacterial experiments use the same container for both the control and experimental bacteria.

Team 9

There’s no better way to start a message to future students than with a cheesy saying; a wise man once said “95% of what I know is from my own mistakes”. As generic and probably obvious as it is, that saying encompasses everything that the next semester needs. Every team will make more mistakes than they thought even could be made, but the teams that succeeded the most really are those that take their mistakes as learning opportunities. Even when it seems like one lesson learned is always replaced by another mistake made, the very most important thing to do is continue to try and continue to learn. The best part about the class is that you don’t have to learn alone, there are so many great resources to help you out, Dan Goddrick, Tim May, Chris Koehler, and the TAs are all incredible with how much they will help you out. To the next solar panel team, we would like to encourage you to find lightweight solar panels in specific, and if you are trying to compare two different types, keep as much consistent as possible, and try to order from the same manufacturer. The Gateway to Space class is a huge learning opportunity that requires a lot of dedication and incredible work ethic, but you will also have some of the most incredible moments of your college career. Have fun, and stay sane!