This TSGC Design Challenge Team Notebook is a reference manual that should prove helpful to each team from the beginning to the end of their participation in the Design Challenge program. All the information contained herein is available for download from the program website. Additional forms, applications, and samples are also available online.

Please contact TSGC at designchallenge@tsgc.utexas.edu with any questions.

**Notes for current conditions under COVID restrictions**
- The health and safety of all personnel should remain paramount.
- The spring 2021 Showcase event will be held virtually, April 20-21, 2021.
- Virtual pathways are encouraged for Team members to meet and work together with their Faculty Advisor and Mentor, and to perform Outreach, Field Trips, and Collaboration.
Program Summary

Each underlined topic is detailed in a later section.

A team of 3-6 students choose a project with their Faculty Advisor and complete the Application process. Once accepted by TSGC, the members work through Team Organization, contact their NASA Mentor, and begin submitting weekly Tuesday Tag-Ups. Throughout the semester the team will work towards accomplishing the milestones listed in the Timetable below, with potential help from Collaborators and Field Experience. The team will first work on Level 1 (profile text and photos), then Level 2 (midterm report and patch design), then Level 3 (poster and video for online display), Level 4 (Showcase event), and finally Level 5 (final report). Funding may be earned, received, and spent by the team for the project throughout the semester (Funding – Team Earnings); these are fixed amounts; TSGC does not reimburse for expenses. At the Showcase, the teams will receive feedback and compete for scholarships (Funding – Scholarships). Teams may also participate in Outreach to enhance their funding and experience. Weekly status updates are submitted as Tuesday Tag-Ups. Formal reports throughout the semester should follow the Writing Guidelines.

Please contact designchallenge@tsgc.utexas.edu with any program questions.

Project Topics
The topic list is revised each semester. Please see the Design Challenge website for the most recent information: http://www.tsgc.utexas.edu/challenge/topics.html

Eligibility
All students currently enrolled at a TSGC academic affiliate institution (community college or university) are eligible to apply: http://www.tsgc.utexas.edu/members/. Applications from women, members of underrepresented minorities groups, and persons with disabilities are highly encouraged.

Undergraduate students may form teams of 3-6 students to apply. Graduate students with an interest in using one or more of the given research topics as thesis or dissertation should contact TSGC to apply separately for a possible Design Challenge Fellowship.

Citizenship considerations: NASA topics may be restricted to US citizens, so visit the Design Topic webpage to check if there are restricted projects. For site visits, NASA and contractors may limit access to US citizens only. TSGC funding is restricted to US citizens, although teams may include non-citizens if the topic allows; at least half of the team members must be US citizens, and non-citizens are ineligible for scholarships.

All team members must meet the eligibility requirements for the call and institution in which they are enrolled and must meet NASA requirements for the design topics. Each eligible student may only participate on only one team. Faculty may support more than one team.
**Timetable (Deadlines for Level Milestones)**

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Profile, Photos, and Patch</td>
<td>Midterm report</td>
<td>Poster and Video</td>
<td>Showcase</td>
</tr>
<tr>
<td><strong>Tuesday, January 26, 2021</strong></td>
<td><strong>Friday, February 26, 2021</strong></td>
<td><strong>Friday, March 26, 2021</strong></td>
<td><strong>Friday, April 16, 2021</strong></td>
<td><strong>Tues-Wed, April 20-21, 2021</strong></td>
</tr>
</tbody>
</table>

Submit weekly Tuesday Tag-Up reports from Level 1 through Level 5

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**Funding <NEW FOR SPRING 2021>**

Teams earn funding for completing the level milestones. Normally, funding is used for both project design and for attending the Showcase event in person (transportation, housing, and meals). Considering the virtual spring event due to continuing Covid restrictions, team funding is $500. If the team completes an optional Outreach event and report, the team may earn an additional $200, bringing their total team earnings for the semester to $700.

Funding is paid by TSGC to the team’s department*. The team may invoice TSGC as earnings are completed. For complete details, please see the Funding sections below.

Important note: any federal budget delay or government shutdown will impact TSGC funding and could impact timeliness, availability, and amount of team earnings and scholarship dollars. Federal funding is not guaranteed.

* For teams located at the University of Texas at Austin, the funding process may be different. Contact TSGC with any questions.
Application
Deadline: Tuesday, January 26, 2021
See the Design Challenge website for application links.

The application communicates a new team’s intention to work on a particular topic and, along with their curriculum vitae (CV), introduces the team to TSGC. Notification of acceptance will be conveyed after the deadline.

- For CVs, please use this filename convention: “CV-institution-team-lastname-firstname.pdf”.

Not all teams that apply may be accepted. Space each semester is extremely limited. Priority is given to senior-level capstone classes. Other considerations include maximizing the number of schools, topics, and mentors involved with the program. Additional considerations and restrictions may apply.

New teams
Submit the Application electronically including 1st, 2nd, and 3rd choice topics and upload each team member’s CV to the link provided above. Teams should gather and discuss this information:
- Institution
- Team name
- Three topic choices
- Course number and title (if class is for credit)
- Faculty Advisor information (department, name, email, phone)
- Department Chair (name, email, phone)
- Department Accounting Contact (name, email, phone)
- Team member information (3 to 6 students)
  - Name, email, major, academic level, birthdate
  - Hometown city and state
  - Country of citizenship (at least half the team members must be US citizens)
  - Team role (leader, deputy leader, or member)
  - Ethnicity, race, gender (Optional for NASA reporting)

Returning teams
Teams continuing for a second semester will email designchallenge@tsgc.utexas.edu with their intention to return to the program and will provide any team member changes.

Responsibilities
After notification of acceptance, teams should
- Review the Level milestones in this Team Notebook
- Begin weekly Tuesday Tag-Ups with Faculty Advisor, Mentor, and TSGC
Level 1: Profile, Photos, and Patch
Deadline: Friday, February 26, 2021
Teams will upload their profile, photos, and patch using an online form to be provided.

The first deadline for each team is to submit Team Profile text, Team Photos, a NASA photo release form, and the Team Patch.

TSGC will use your Profile, Photos, and Patch to create the Team Profile Page and other promotional materials that will be shared at the Design Challenge Showcase event.

Team Profile
Teams will upload approximately 400 words (plain text only) of team information including: project design goals; team members’ goals, hobbies, plans, etc.; background on your team’s name and patch design; and any other trivia you wish to share.

- Please use this filename convention:
  - Filename: TeamProfile-Institution-Team.txt or .docx

- For example profiles, see the sample Team Profile pages on the website: http://www.tsgc.utexas.edu/challenge/PDF/team_profile_page_examples.pdf

Team Photos and Photo Release Form
Teams will upload
(a) a head shot of each individual team member, and
(b) a group photo of the entire team.

Submit photos as EPS, JPG or TIFF files only.
- Please use this filename convention:
  - Individuals: Photo-institution-team-lastname-firstname.jpeg
  - Team: TeamPhoto-institution-team.jpeg

Download NASA Media Release for Adults at: https://bit.ly/3scB2Qf
- Fill out and save the form as PDF, and rename with this filename convention: "LastName-FirstName-NASA-DesignChallenge-Media-Release.pdf"

Team Patch
See the Patch Design section for an explanation of the patch and its purpose.

- For the patch, please use this filename convention:
  Patch-institution-team.eps (or .jpg or .tiff)

Returning teams
Teams continuing for a second semester may update their information if there are any team member changes or as desired. Otherwise, to complete Level 1, please send an email to TSGC indicating that there are no changes.
Level 2: Midterm Report  
Deadline: Friday, March 26, 2021  
Teams will upload their report using an online form to be provided.

The Level 2 milestone is the Midterm Report. Design concepts take shape for first semester teams, customer (Mentor) needs are addressed, and a method of down-selection is implemented. Second semester teams are fine-tuning designs and constructing models or prototypes.

For the midterm report, please use this filename convention:  
Midterm-Institution-Team.pdf

**New teams**
- Follow the Writing Guidelines
- Use quantifiable requirements/constraints to demonstrate customer needs
- Profile concept variants and determine concept feasibility/down-selection
- Consider safety & risk factors
- Incorporate visual elements to communicate concepts to reader
- Adjust project timeline and budget plan
- Appendices:
  - Pugh Chart/decision matrix
  - Budget Report
  - Team Trip Report (Field Experience, if completed)
  - Outreach report (if completed)
  - Others as needed

**Returning teams**
- Follow the Writing Guidelines
- Provide an update on project status
- Discuss any issues and modifications
- Report testing data and preliminary results
- Estimate actual cost to develop for production
- Adjust project timeline as needed
- Appendices as needed

*Note concerning Class Reports: Design Challenge requirements are not intended to cause students to duplicate work. Teams required by their instructor to submit a Midterm Report in a specific format may submit a copy of that report in lieu of the Design Challenge-style Report, as long as all necessary information is included or added. Contact TSGC with any questions.*
Level 3: Poster and Video
Deadline: Friday, April 16, 2021
Teams will upload their virtual poster and video link using an online form to be provided.

Level 3 marks the end of the semester's major work: design-related activities come to a close, testing and data collection is completed, and conclusions are drawn. Final results are prepared and delivered via poster and video for the Design Challenge Showcase.

All teams
- Upload a virtual poster
  - Convert your file to Adobe PDF format
  - Use this filename convention: Poster-Institution-Team.pdf
  - On the poster please include at least one student contact email address for reviewers to ask questions.
- Upload your team video presentation
  - Video must be no longer than 10 minutes
  - As best as you can, try to have each team member speak.
  - Must be in MOV, MPG, or MPEG4 formats; 10 GB limit
  - Filename convention: Video-Institution-Team.MOV or .JPG or .MPEG4

Online Poster Review – Monday, April 19 through Sunday, April 25, 2021
All Showcase participants have the opportunity to review team Posters and Videos.

Poster
- Each team’s poster display will profile the design project with textual and visual information.
- It should be an easy-to-follow summary of the project for those unfamiliar with the topic.
- Photos of any models, prototypes, schematics, etc. are strongly encouraged.
- At least one student team member’s email should be included as a contact for any questions.

Video
- Teams are allowed a maximum 10 minutes for their video which will be played online by TSGC during the Showcase.
- As best as you can, try to have all team members speak. Some may speak longer, but we wish all students to have the opportunity and experience of presenting.
- A question and answer period will follow the team video presentation.

Presentation tips
- Keep slide content simple and easy for the audience to read.
- Bullet the main points to be addressed.
- Try to limit each slide to no more than 5-6 bullets and each bullet to 8-10 words maximum.
- Use plenty of visuals (photos, graphs, drawings) to enhance ideas presented.
• Speakers should not read from the slides but should use the bullet points to add details and descriptions to the topic being presented. Using notecards as a reference is ok.
• Avoid slides with too much information. If detailed material is necessary to show on the screen, you may need to use two sides instead of crowding words onto one.
• Allow time for background material. Most of the audience is new to your topic.
• Consider the visibility of font type, color, and slide layout.
• Dark background with a light text shows up best in meeting rooms.
• Text should be large enough for the audience to read, about 24-point font (30-point or larger for titles)
• Practice. Practice. Practice. The team should practice together exactly as they wish to perform. Timing is critical.
The spring 2021 Showcase will be a virtual event where teams display their posters and video and participate in a question & answer (Q&A) session.

The Design Challenge Showcase is the culmination of the project and offers teams the opportunity to present their projects to NASA personnel and academic and industry partners. Showcase provides teams with a formal venue where they can display and discuss their design efforts and accomplishments.

**Audience**
Teams can expect an audience of 100-150 people that includes the NASA JSC community, academic and industry partners, TSGC representatives, educators and other invited guests, other student teams and their Faculty Advisors and Mentors. The virtual Showcase may have many more viewers.

**Awards**
Team recognition and achievement awards (Scholarships) are presented at the conclusion of the Showcase. Several professionals act as judges for the poster and oral presentations. Teams also score each other in the poster category. Judges’ scores are normalized, high and low scores for each team are dropped, and the average team score is used to determine team rankings for each award category.

**Online Guidelines**
- Showcase will be hosted through a Zoom Webinar with a live simulcast online.
- Webinar participants (all attendees, panelists, and hosts) do not need to download Zoom, but will need to register with a valid email address.
- Attendees on Zoom or watching the live simulcast will not be visible or heard.
- During each team’s presentation, student team members will be promoted to “webinar panelist” to allow them to share audio & video for the duration of their Q&A session.
- Questions will be submitted through a third-party interface so that YouTube viewers may participate.

**Presentations**
- TSGC will play each team’s video (10 minutes maximum) and then the team will participate in a Q&A session with the audience.
- All team members should join the Showcase webinar on the day they are presenting, and we request that each person view as many of the other talks as possible.
- Registration for Showcase will occur approximately 3 weeks before the event.
• After all teams have confirmed registration, the presentation schedule will be finalized and a *Showcase Registration Information Packet* will be sent out providing complete details of the event.

**Awards**

TSGC presents awards (Scholarships) to the top design teams based upon judges' scores. Several NASA, TSGC, faculty, and other professional audience members will act as professional judges. Additionally, teams will provide feedback and score each other on the Posters and Videos using a simplified judging rubric. All scores are normalized. High and low scores for each team are dropped. Finally, an aggregate score recognizes the top overall design teams with scholarship awards. See the sample scoring rubrics below.

<table>
<thead>
<tr>
<th>POSTER / VIDEO</th>
<th>Low</th>
<th>Avg</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Visual</strong>: Legible text &amp; images, acknowledgements &amp; references, organization, grammar and creativity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Background</strong>: Project background and research goals clearly explained</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Trades</strong>: Design trades support goals and decisions are clearly described and logical</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Technical</strong>: Team technical understanding demonstrated, work technically sound</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Results</strong>: Significant and convincing conclusion, Design Challenge met</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Future</strong>: Future work or direction described</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>• <strong>Q&amp;A</strong>: Good Q&amp;A responses (video only)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
The final team milestone for each semester is the Final Report. This report should build upon the Midterm Report and should cover all materials generated. Feedback from the Showcase experience should be incorporated.

All requirements must be completed to the satisfaction of TSGC as outlined above to qualify for team earnings (Funding) and awards (Scholarships).

Following submission of the Level 5 Final Report, the team Faculty Advisor may invoice TSGC for the team earnings. If your academic institution’s semester closure schedule will prevent timely submission of the team’s end-of-semester invoice, please contact TSGC as soon as possible to make other arrangements.

Note: Each semester, for NASA reporting purposes, TSGC needs the Faculty Mentor to provide a cost-share estimate for his/her work with the Design Challenge team. A line for this purpose is included on the team invoice form.

*Note concerning Class Reports: Design Challenge requirements are not intended to cause students to duplicate work. Teams required by their instructor to submit a Final Report in a specific format may submit a copy of that report in lieu of the Design Challenge-style Report, as long as all necessary information is included or added. Contact TSGC with any questions.*
Funding – Team Earnings
Submit an invoice at the end of each semester to collect team earnings.

<table>
<thead>
<tr>
<th>Level 1</th>
<th>$0</th>
<th>Team photos, profile, and patch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2</td>
<td>$50</td>
<td>Midterm report</td>
</tr>
<tr>
<td>Level 3</td>
<td>$100</td>
<td>Poster and video</td>
</tr>
<tr>
<td>Level 4</td>
<td>$150</td>
<td>Showcase</td>
</tr>
<tr>
<td>Level 5</td>
<td>$200</td>
<td>Final report</td>
</tr>
<tr>
<td>Semester Total</td>
<td>$500</td>
<td>-</td>
</tr>
<tr>
<td>Optional Outreach (additional)</td>
<td>$200</td>
<td>Outreach report</td>
</tr>
</tbody>
</table>

How to receive funding
- When a new team is accepted into the Design Challenge, TSGC sends a notification letter to the Team and Faculty Advisor.
- The Faculty Advisor uses this letter to establish a team account through your department accounting office.
- Teams accumulate throughout the semester after completing milestones.
- At the end of the semester, the Faculty Advisor submits an invoice to TSGC.
- TSGC authorizes payment to the team’s department and funds are transferred (process is different for teams from the University Texas at Austin)
- The Team and Faculty Advisor may get reimbursed for travel and project expenses through their department.

How do Team Earnings work?
- Project/Travel Funds: At the end of the semester, TSGC sends the Team and Faculty Advisor a letter telling the team how much it has earned. To retrieve the earnings, TSGC must receive a signed invoice from your institution from the team Faculty Advisor, department accountant, or university contracts contact. A sample invoice will be emailed to the team at the end of the semester or contact designchallenge@tsgc.utexas.edu for a copy. The invoice may be submitted as funds are earned at each level or saved until the end of the semester when a total award amount is determined.
- Rules of use: NASA is a federal agency; therefore, some restrictions exist on how team money may be spent or distributed. For example, the following expenditures are generally considered allowable:
  - Reference materials  - Equipment rental  - Postage  
  - Software  - Display materials  - Model materials  
  - Team travel  - Meeting expenses  - Registration fees  
- And these expenditures are not allowable:
  - Non-project travel  - Regular meals  - Entertainment  
  - Alcohol  - Activity fees  - Personal use
• All funds received from TSGC from milestone earnings must be used for the direct purpose of addressing the Design Challenge topic.
• Funds remaining at the completion of the team’s participation will remain with the Faculty Advisor and may be spent at his/her discretion

Important notes
• TSGC does not reimburse team members directly. TSGC pays your department, then you go through your standard departmental reimbursement process for any expenses incurred.
• The team may plan a budget of $500 for the semester based upon successfully completing all milestones (or $700 if also completing Outreach).
• Note that this amount is designed to encompass construction and travel costs. A good estimate of the hotel group rate is $120 per room. Your department accounting office can help with estimating mileage and other costs.
• Team members are cautioned against using their own money to pay for project expenses. Ask your Faculty Advisor if the department may be able to advance funds until the team funds transfer from TSGC to your department. Understand that university paperwork may move slowly, and reimbursement may take longer than your budget can spare.
• Your department accountant has no idea how much money the team has earned – or what a Level award is – but does know how to get the money to pay for your project. Work closely with this person to establish a team account and budget.
• Budget carefully. TSGC is not responsible for covering team over-expenditure.
• Save receipts to be reimbursed by your department. TSGC requires a single invoice from your department with total team earnings each semester, not expenditures.
• Get to know your department accountant who is responsible for processing your travel paperwork and managing the team account.
• Your Faculty Advisor or department accountant has knowledge of what type of spending is considered eligible for reimbursement. Always check your institution’s rules for reimbursement before spending.
• Funds from TSGC are for the sole use of the team members and Faculty Advisor.
• Avoid paying unnecessary taxes. Universities are exempt from paying certain kinds of sales or hotel taxes. Talk to your department accountant about what supply and travel costs are tax exempt. TSGC will include a tax-exempt form in your packet for the Showcase hotel.
• Any federal budget delay or government shutdown will impact TSGC funding and could impact timeliness, availability and amount of team earnings and scholarships. Federal funding is not guaranteed.
FAQ
Q. Where does the money come from?
A. Space Grant funding is appropriated annually in the federal budget by Congress, then passes from NASA’s Office of STEM Engagement to TSGC. The official term for this is a federal pass-through grant. TSGC delivers the money that your team earns to your department by way of an Award Agreement between your institution and TSGC (located at the University of Texas at Austin).

Q. How does the money get to the team’s institution?
A. At the beginning of the semester, TSGC will send the Design Challenge acceptance letter to your team’s Faculty Advisor, who will pass it on to your department accountant. In most cases, this letter paves the way for the Faculty Advisor to set up a team account. Note: Teams from the University of Texas at Austin have a different process.

Q. We’ve finished and are under budget. How can leftover funds be used?
A. Any team earnings remaining at the end of either semester may be used at the discretion of the Faculty Advisor. Here are some examples of how faculty have put surplus earnings to good use:
- For next semester’s team expenses or for next year’s Design Challenge team
- End of semester team celebration
- Distributing leftover funds as scholarships to the team members
- Display case for use by the department to house student projects and awards
- Software, hardware, books, or lab equipment for classroom use
Policies vary by institution, so don’t assume that because one institution spent funds in a particular way that your institution will allow the same thing. Check with your department first.

Q. I need to purchase a (suit / haircut / car tires / etc.) for Showcase. Is that allowed?
A. No. Only project-related expenses are allowed from team earnings. Your department may help the team secure a rental car and this can be charged to team funds. (However, any scholarships that the team members may be awarded after Showcase are unrestricted in their use.)

Q. Why do we have to use our own credit cards to pay for our Showcase expenses?
A. Typically when on university travel, expenses are paid with a personal credit card and reimbursement is received later after submission of a travel expense form and receipts to your department. Do not submit receipts to TSGC. TSGC is able to set up the group rate at the hotel but cannot directly pay or reimburse for the rooms. Contact your Faculty Advisor to see if your department can book the rooms for your team or provide a cash advance.

Q. What happens if we go over budget?
A. The consequences are up to your department. If you paid for any expenses out of pocket, you may not be able to get reimbursed. Only your department can reimburse you for team expenses, TSGC cannot. Check with your Faculty Advisor before spending any funds.

Have other funding questions? Please contact designchallenge@tsgc.utexas.edu
Funding – Scholarships
Teams compete for scholarships at the Showcase.

Top teams are recognized for exceptional work at the Showcase event and these awards make up a competitive component of program participation. Showcase awards are provided directly to team members as scholarships and are therefore not restricted in manner of use. Award amounts may vary significantly each semester and are limited by the level of TSGC scholarship funding available. NASA funding for scholarships are restricted to US citizens only.

The highest award is for the Top Design Team, based on the sum of team achievements. What criteria determine the Top Design Team? Most importantly is the team’s placement in Showcase judging categories. Other factors may include design characteristics, administrative details (meeting deadlines), reviewer feedback, design innovation, and overall success of the project.

How does Scholarship funding work?
• If your team earns scholarship awards at Showcase, team members will be sent a “Scholarship Forms” instruction packet (US citizens only)
• This packet provides TSGC with information necessary for the disbursement of scholarship funds.
• Each team member must submit a “Scholarship Forms Packet” to TSGC before scholarship funds can be distributed.
• This money is delivered via a separate TSGC account directly to the students and there are no restrictions on the use of scholarship funds.
Finding the right students to comprise the design team can be a very challenging aspect of the program. Sometimes the team members are assigned to work together by the course instructor, other teams are self-selected. However the student teams are put together, they are a group of individuals who may not be used to working closely alongside others. Learning to draw upon each team member’s strengths while maintaining good group dynamics is critical to team success.

NASA has strong history of putting successful teams together to accomplish a monumental goal. Experts in team organization offer the following tips on getting a student design team off to a good start.

**Get Acquainted.** Make an effort to get to know each other and learn what each team member brings to the table. Meet outside class to watch a space-themed movie like *Apollo 13*, *Gravity*, or *The Martian*. Discuss the teamwork that was necessary to reach a successful conclusion.

**Establish Group Goals.** Sometimes the “big picture” can overwhelm less experienced team members. Use Design Challenge milestones to help the team set incremental goals.

**Strike an Expectation Agreement.** The team, as a group, will not be successful if team members don’t agree on what is to be expected from individuals and the group as a whole. It works best if expectations are established early:
- What is expected from each team member?
- What level of participation is required from each member to guarantee success?
- How do you identify and what happens if expectations are not met?

**Establish Roles** for individual team members and set expectations for each. Read through the list of milestones to see if specific requirements suit the talents of someone on the team. After a Team Leader and Deputy team Leader are identified, assign other roles to lead communication, track the budget, take photos, proofread, program, contact Collaborators, plan the Field Experience, Outreach, etc. Members may have multiple roles.
Be organized. Although each team designates a Team Leader, a single person cannot get the team through successful project completion alone. Every person in the group will need to devote substantial time and effort to the project.

Communicate. Make sure everyone knows what’s going on with the team and the design. The team leader is usually the primary contact between the team members and with TSGC, Faculty Advisor, Mentor and others. An alternate member or a “Communication Officer” may serve instead or as a backup.

Address Problems Early. Keep your Faculty Advisor informed of any team problems, and keep your Mentor informed of any technical issues. Plan a strategy for addressing problems to keep them from impacting the team’s long-term design effort.
Each team is required to have a Faculty Advisor to oversee team progress and to advise the team. This is an easy requirement to fulfill since most teams are already enrolled in a course led by member of your institution’s faculty. Teams should work efficiently with their advisor, since working with the Design Challenge team will add a time commitment to the advisor’s already busy schedule.

### Advisor Role

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Expectations</th>
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<tbody>
<tr>
<td>- Instructor of an organized course or independent study</td>
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<td>- Assures the team is academically capable and prepared</td>
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<td>- Facilitates team/mentor communication for discussion of scope of research and Mentor’s expectations</td>
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<td>- Helps direct and review the team’s report writing</td>
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<tr>
<td>- Verifies that design activity is the work of the student team members and that all members are contributing</td>
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</tr>
<tr>
<td>- Attends TSGC Design Challenge Showcase with the team, or designates a representative from the team’s institution to attend on his/her behalf</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Principle Investigator</th>
<th>Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Oversees initial set up and review of team funding</td>
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<tr>
<td>- Ensures that the team uses awarded funds as intended and avoids overspending</td>
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<tr>
<td>- Reinforces that team members should <em>not</em> use their personal funds for team expenses</td>
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<tr>
<td>- Instructs the team on departmental policies for travel, hotel, per diem, car rental, tax exemptions, etc.</td>
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</tr>
<tr>
<td>- Submits the end-of-semester invoice in a timely manner to TSGC for funding</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Manager</th>
<th>Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Helps the team focus on technical aspects of the design as it moves toward meeting the Level requirements in a timely manner</td>
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<tr>
<td>- Evaluates the team’s work for meeting Mentor expectations and high academic standards</td>
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<tr>
<td>- Helps with interpreting reviewer comments and suggesting solutions</td>
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<tr>
<td>- Remains attentive to team progress: aware of what the team is submitting including Tuesday Tag-Ups; brings any technical, financial, or personnel issues to the attention of TSGC</td>
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</table>

Note: Each semester, for NASA reporting purposes, TSGC needs the Faculty Mentor to provide a cost-share estimate for his/her work with the Design Challenge team. A line for this purpose is included on the team invoice form.
Each research group submitting a topic to the Design Challenge agrees to provide a Mentor point-of-contact to work with the student design team. Once teams and projects are selected, TSGC notifies the Mentor that a team is forming and provides contact information to everyone involved.

**What the team should know about their Mentor:**

| What are the customer’s needs? | - Think of the team’s Mentor as the design team’s customer.  
- Work with your Mentor to establish design specification needs immediately upon forming the team.  
- The team’s Faculty Advisor is encouraged to contact the Mentor to ensure the team’s plans align with expectations.  
- Run ideas by the Mentor to make sure the design is on track. |
|--------------------------------|---------------------------------------------------------------|
| How much time will the Mentor spend with the Team? | - Mentors volunteer their time to work with Design Challenge teams, so remember that his/her regular job comes first.  
- If Mentor availability becomes an issue, please let TSGC know so that we can help find additional resources. |
| What should the Team expect from the Mentor? | - The Mentor offers the team a NASA-affiliated project that includes background info, technical specifications, and design parameters.  
- Mentors make a best effort to review reports and to attend the Showcase event.  
- Mentors generally let the team define the course of the project, while at the same time guide the team toward a goal.  
- The Mentor may, but is not expected to provide resources (hardware, software, materials) for construction or testing.  
- A site visit (Field Experience) may be offered (or ask if possible) but should not be expected. The Mentor is not expected to travel to visit the team. |
| What should the Mentor expect from the team? | - Regular weekly updates via the Tuesday Tag-Ups.  
- Copies of all reports, posters, videos, and other project work.  
- The Mentor is not entitled to items purchased by the team with TSGC funds (models, equipment, software or parts), although the team/department/institution may donate them.  
- If the Mentor agrees to loan the team equipment or samples, the expectations need to be clear, and the team responsible for ensuring their return at the end of the project. |
Collaborators

The team should seek ways to collaborate with individuals outside their primary group (Team, Faculty Advisor, and Mentor). Outside collaboration is important because it brings the team new ideas on how to approach the design project: drawing on the experience of experts, exploring ideas of others, and gaining new design perspectives brings dimension and integrity to the project.

<table>
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<tr>
<th>Collaborate with whom?</th>
<th>Why?</th>
<th>How?</th>
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<tbody>
<tr>
<td>Anyone who can offer the team advice, assistance or a new perspective on any aspect of the design effort, such as:</td>
<td>Proven benefits include:</td>
<td>Finding people to collaborate with is easy:</td>
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<tr>
<td>- Students from another design team, another academic discipline, or another university</td>
<td>- <strong>Design focus</strong> gained from exposure to more diverse levels of experience</td>
<td>- <strong>Talk</strong> to people in the community whose interests align with your project</td>
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<td>- Graduate students or postdocs with expertise in your topic's research area</td>
<td>- <strong>Outside inspiration</strong> motivates the team</td>
<td>- <strong>Search</strong> the web for related research to find unexpected sources and contact authors</td>
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<td>- Other Faculty, Technicians or Specialists within the university</td>
<td>- <strong>Background information</strong> used in decision making is broadened</td>
<td>- <strong>Meet</strong> with your collaborators; take a field trip or invite them to a team meeting</td>
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<tr>
<td>- Experts outside your university from the academic or industry community</td>
<td>- <strong>Team perspective</strong> is more diversified adding more validity to the solutions the team presents</td>
<td>- <strong>Communicate</strong> openly and often among team members and collaborators</td>
</tr>
<tr>
<td>- <strong>Primary and Secondary Teachers</strong> for outreach ideas</td>
<td>- <strong>Creative and multi-disciplinary solutions</strong> are generated</td>
<td>- <strong>Share</strong> information and progress with a website, Facebook page, or Tuesday Tag-Ups</td>
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Field Experience

Teams are encouraged to use Design Challenge as an opportunity to gain Field Experience, taking advantage of the opportunity to explore beyond their campus community. Teams are encouraged to use funds for travel associated with team field trips.

A team trip may be taken to enhance the team’s knowledge of:
  - Design project
  - Careers & workplace
  - Collaboration opportunity
  - Associated research
  - STEM related activities
  - Invention & design

Acceptable ways to use field experience funds include:
  • NASA JSC or NASA-contractor facility visit (may be limited to US citizens)
  • Project-associated tour of a research facility
  • Explore degree or career opportunities
  • Travel to meet with Mentor or Collaborators
  • Attend a professional-level meeting or conference

Check with your Faculty Advisor or TSGC if you have questions about whether or not a field trip is acceptable for use of team earnings.

Check with your department accounting contact in advance to find out how to be reimbursed for any travel-related charges you incur. Be sure to let your department’s administrative desk know that the team intends to travel – there may be forms that you will be required to complete before your trip.

Teams are encouraged to document the field experience with photos and a report as an Appendix to any Level report.
Participation in outreach activities is highly encouraged by NASA as a way to spread excitement about Science, Technology, Engineering and Mathematics (STEM) to the community at large. Outreach offers each team the opportunity to get involved and, at the same time, earn additional project funding. Outreach activities may be conducted with K-16 classrooms, youth groups, STEM clubs, museums or public STEM events.

**Outreach Parameters**

- Present, demonstrate, or display any STEM-related activity with an audience.
- Incorporate outreach at any time during the semester (or between semesters for two-semester teams)
- The funding bonus award of $200 is available once per semester.
- Document the activity as an Appendix to your team’s Midterm or Final Report.

**Outreach Report Parameters**

- 500 words minimum and 1 or more photos of the team conducting the activity
- Describe the activity presented, what the team learned though this outreach, what questions or feedback the team received, and what impact the team believes they made.
- Must include this basic event information (necessary for NASA reporting):
  - Name of the event
  - Date(s) and length of the event (e.g., 2 hours or 2 days)
  - Location (city & zip code)
  - Audience type and number of people for each type (estimated)
    - Choose all that apply: students, parents, educators, public
    - Include specific student level(s): elementary, middle school, high school, undergraduates, graduate students
In the spirit of NASA tradition, Design Challenge teams are required to submit a team-created patch with their Level 2 midterm report. Have some fun and call on your creative side to design a patch that represents the team and its mission. If no one on your team is graphically inclined, try collaborating with someone outside the team who is.

Since Gemini 5 in 1965, each crew assigned to a NASA space flight mission has designed its own mission patch. Included in the patch design are various elements that represent the crew, the mission, the mission number, and the fact that they are all “in this together.” The original TSGC Design Challenge mission patch was designed during the program’s first official semester of operation in Spring 2003. Each semester since, the original design has been updated so that each semester’s program patch is unique.

### Patch Design Specifications

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<tr>
<td><strong>Drawing</strong></td>
<td>• Use any program: vector-based (line art/drawing) or a raster or bit-mapped (photograph-like images)</td>
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<td>• Hand drawn is fine too. Draw large to scan at high resolution.</td>
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<td></td>
<td>• The design may be simple or detailed.</td>
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<td><strong>Size and shape</strong></td>
<td>• The patch can be any shape</td>
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<td></td>
<td>• The patch may be constructed at any size, but remember that the final size is meant to be about 4 inches width and height.</td>
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<tr>
<td><strong>Delivery</strong></td>
<td>• Send the patch to TSGC as a separate high-res attachment.</td>
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<td>• Include the patch image and description in the Level 1 Report.</td>
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<tr>
<td><strong>Format</strong></td>
<td>• EPS format preferred. JPG and TIFF are acceptable.</td>
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<td></td>
<td>• High resolution: 300 dpi or higher</td>
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<td>• Colors should be formatted as RGB or CMYK.</td>
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A few samples of team patches are below. More may be found on the TSGC website.
The weekly Tuesday Tag-Up will be used as a means for the Team Leader or communication person to brief your Faculty Advisor, Mentor, TSGC, and any necessary Collaborators on the design team’s weekly progress.

- Reports are emailed every Tuesday (or another consistent day of the week if your class has an alternate delivery schedule), starting from the date the team’s Design Brief application is accepted until the team’s Final Report has been submitted.
- If one single requirement is going to keep the team on track this semester, it will be this weekly briefing. Although the weekly repetition may become tedious, it is regarded as one of the best tools for maintaining communication and assuring everyone involved with the project that progress is being made.
- The Tuesday Tag-Up lets the Faculty Advisor, Mentor, and TSGC know how the team is working, and it lets the team know that we are listening.
- In the report, the Team should provide an update on accomplishments, budget updates, bring up any issues or concerns, and report the plan for the next week.
- Use the format shown in the example below, including the Subject line.

Sample weekly report:

From: Student Team Leader or Communication Officer  
To: Faculty Advisor, NASA Mentor, Collaborators, TSGC <designchallenge@tsgc.utexas.edu>  
CC: All Team members  
Subject: Space Blasters – Tag Up – Week #3

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Team: Space Blasters  
Institution: University of Texas at Austin  
Topic Title: Effects of Barbeque Deprivation on ISS Crews

Although this week started off rather slow, it ended on a good note…

Overall project status: How is the project going? Is everything on target?  
Activities this week: What has the team been doing this week? Any meetings?  
Problems encountered: Any surprises thus far?  
Approximate number of person-hours spent on design activity this week: How much time did the team devote to the project this week?  
This week’s budget items: Any expenses incurred?  
Activities planned for next week: What do you have planned for next week?  
Additional comments: Anything else you want to mention?
The following guidelines may help teams address milestones for the levels that ask for a report or poster. Please submit all reports in Adobe PDF format.

*Note concerning Class Reports:* Design Challenge requirements are not intended to cause students to duplicate work. Teams required by their instructor to submit a Midterm or Final Report in a specific format may submit a copy of that report in lieu of the Design Challenge-style Report, as long as all necessary information is included or added. Contact TSGC if you have questions.

| General | 1” margins, minimum 12-point font  
| No page limits, however extensive collections of data, tables, photos, or graphics should be placed in Appendices at the end of the report  
| Avoid writing in first person  
| Check grammar and spelling. Double check. Triple check.  
| Submit PDF copies to TSGC, Faculty Advisor, Mentor, and Collaborators |
| Introductory Material | Include a cover page with the project title and intro information.  
| Include a one-paragraph summary or abstract  
| Where necessary, include a table of contents, list of figures or tables  
| Be thorough when providing information about the team members, Faculty Advisor, Mentor, and Collaborators |
| Background | Explain where the project originated and what it is about. |
| Objective | Describe project goal/objective, including continuation of previous efforts. |
| Design Plan | Detail the teams plan or methods for meeting the design objective. |
| Accomplishments | Chronicle the key accomplishments that the team has experienced to date. |
| Timetable | Provide a timetable for completion of the project. |
| Budget | Provide a table showing the team’s budget plan. Include projected and actual earnings and expenditures associated with the project. |
| Conclusion | Sum up. Include future project plans and potential applications. |
| Research/References/Bibliography | Discuss specific resources you have used to conduct research  
| Include a reference list.  
| Academic standards regarding original work apply. |
| Appendices | Field Experience, Outreach report, data, code, drawings, etc. |