STEM ON THE GROUND

CHALLENGE 1: LET'S GET MOVING!

What do you do when you have a task that is unsafe or even impossible for a human to complete? One solution is to use a remotely controlled vehicle. Sometimes referred to as a "robot," these adaptable, yet untethered, machines are used everywhere from the deepest oceans on Earth to the surfaces of other planets. In this challenge, you will be investigating the foundation of any robot that has to move across solid surfaces. You'll begin building a base that is able to move around obstacles and is adaptable to future challenges.

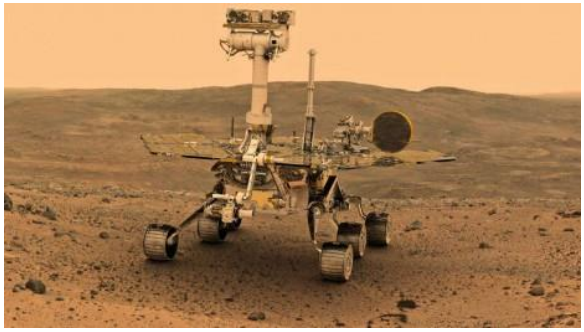
YOUR MISSION:

Design and create a remotely controlled vehicle that can move across various terrains and around a variety of obstacles. Your robot should be durable, agile, and easy to control.

PROCEDURE:

Your robot will be tested on an obstacle course that will challenge your design as well as your driving skills. Once placed on the field, your robot will need to drive around and through several obstacles. Achievements will be awarded for both accuracy and efficiency. There are four obstacles:

1. **Around the Bend:** large diameter turn
2. **Around the Corner**: small diameter turn
3. **Through the Chute:** travel between the rails
4. **Object Avoidance:** run the slalom passing through three consecutive pairs of objects



MISSION CONSTRAINTS:

- Robot must be controlled remotely.
- All team members must control the robot at least once during testing.
- An obstacle is considered "cleared" if your robot does not cross any boundaries or alter any objects while moving around the obstacle.

MISSION CRITERIA (ACHIEVEMENTS):

- Robot clears at least one obstacle when driven by each team member (minimum criteria for success).
- Robot clears all obstacles when driven by each team member.
- Robot clears all obstacles in one run.
- Robot clears all obstacles in under 2 minutes.
- Robot clears at least one obstacle while being driven in reverse.
- Robot clears all obstacles in reverse.

MISSION ACHIEVEMENTS:

- **Robot clears at least one obstacle when driven by each team member (minimum criteria for success).**

	Team member 1	Team member 2	Team member 3	Team member 4
Around the Bend				
Around the Corner				
Through the Chute				
Object Avoidance				

- **Robot clears all obstacles when driven by each team member**

	Team member 1	Team member 2	Team member 3	Team member 4
Around the Bend				
Around the Corner				
Through the Chute				
Object Avoidance				

- **Robot clears all obstacles in one run.**

Around the Bend	
Around the Corner	
Through the Chute	
Object Avoidance	

- **Robot clears all obstacles in under 2 minutes.**

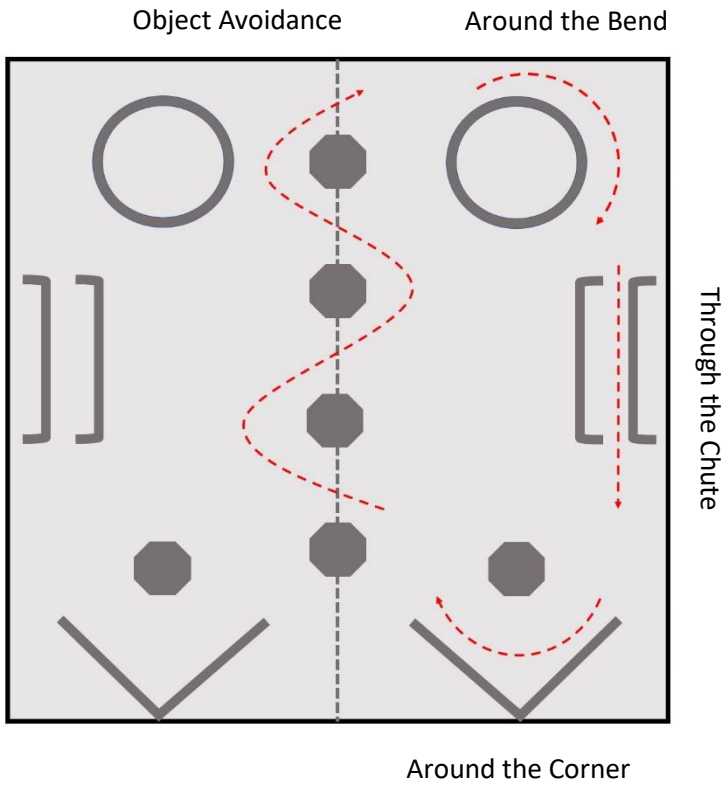
Around the Bend	
Around the Corner	
Through the Chute	
Object Avoidance	

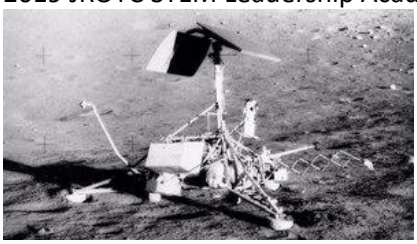
- **Robot clears at least one obstacle while being driven in reverse.**

Around the Bend	
Around the Corner	
Through the Chute	
Object Avoidance	

- **Robot clears all obstacles in reverse.**

Around the Bend	
Around the Corner	
Through the Chute	
Object Avoidance	





STEM ON THE GROUND

Challenge 2: Let's Get Working!

All robots are designed with a purpose in mind, and these purposes can vary greatly. Robots are traditionally used for tasks that would be unsuitable for a human to do, mainly because these tasks are dangerous, or inaccessible to humans. Dangerous tasks like bomb disposal or handling hazardous waste, as well as inaccessible tasks such as interplanetary exploration, are all perfectly suited to robots. To fulfill their purposes, many robots are required to interact with their environment, and the world around them. Sometimes they are required to move or reorient objects from their environments without direct contact by human operators.

YOUR MISSION:

Design and create a remotely controlled vehicle that can move various objects around a field and place the items in designated areas. Your robot should be able to push, lift, and stack objects of varying shapes and weights.

PROCEDURE:

You will test your robot by working to move various objects around a field. You will design a robot that can gather, stack, and collect items. Once you have a working design you will be able to test for mission achievements by completing each type of activity. Each type of activity is described below:

1. **Gather:** Place a ball within the designated corner of the field
2. **Collect:** Place a ball within the designated ring
3. **Stack:** Place a cup within the designated area

MISSION CONSTRAINTS:

- Robot must be controlled remotely.
- All team members must control the robot at least once during testing.
- A ball is considered "placed" when the entirety of the ball is within the boundaries of the designated area; a cup is "placed" if it only touches the cup below it.

MISSION CRITERIA (ACHIEVEMENTS):

- Each team member places at least one object (minimum criteria for success)
- Each team member places all objects in a single run
- Team places at least one object of each type
- Team places all objects in the correct area (excluding only 1 cup used as the bottom of a stack)
- Team places at least 5 objects in under 2 minutes
- Team places all objects in under 2 minutes (excluding only 1 cup used as the bottom of a stack)

MISSION ACHIEVEMENTS:

- Each team member places at least one object (minimum criteria for success).

	Team member 1	Team member 2	Team member 3	Team member 4
Gather				
Collect				
Stack				

- Each team member places all objects in a single run.

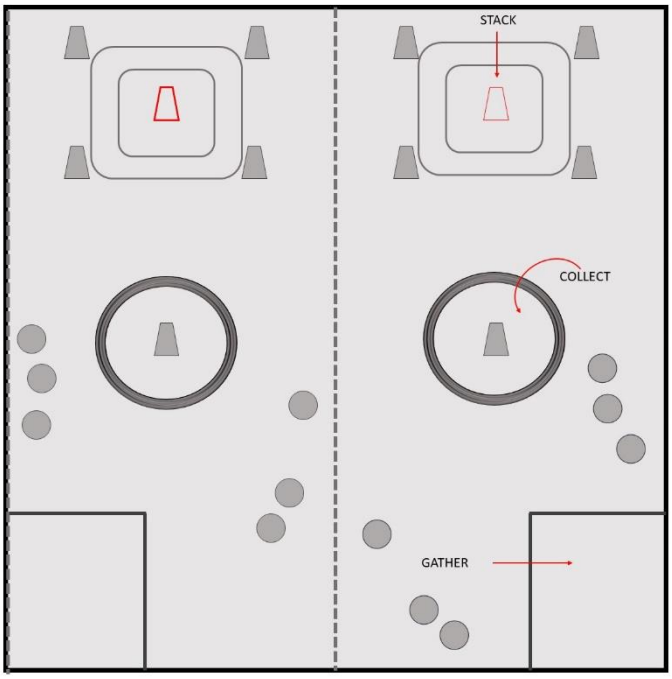
	Team member 1	Team member 2	Team member 3	Team member 4
Gather				
Collect				
Stack				

- Team places at least one object of each type.

	Team
Gather	
Collect	
Stack	

- Team places all objects in the correct area (excluding only 1 cup used as the bottom of a stack).

	Team
Gather	
Collect	
Stack	



- Team places at least 5 objects in under 2 minutes.

	Team
Gather	
Collect	
Stack	

- Team places all objects in under 2 minutes (excluding only 1 cup used as the bottom of a stack).

	Team
Gather	
Collect	
Stack	

STEM ON THE GROUND

Final Challenge: Department of Defense Request for Proposal

Your team has received word that the Department of Defense (DoD) is requesting proposals for funding to build multi-functional remotely controlled robots to complete various tasks in both combat and emergency situations. The actual tasks are top secret and will only be revealed to the company that receives the contract to produce the robots. They are, however, releasing specifications for exercises that are meant to model the actual tasks which must be completed for any proposal to be considered.

YOUR MISSION:

Design and create a prototype robot that could be submitted along with a proposal for the DoD contract. Your team is only tasked with the prototype design and build. Another team within your company will handle the financials based on your design.

PROCEDURE:

You will design a robot that can complete different types of tasks in a single test. Once you have a working design you will be able to test for mission achievements on a designated portion of the field. You will test your robot by completing a variety of different types of tasks. These task types are described below:

1. **Traverse multiple terrains:** Your robot must be able to climb up and over a series of platforms. It must travel across the each of the three platforms.
2. **Debris removal:** Your robot must gather balls and deposit them within the designated bin.
3. **Search and rescue:** Your robot must be able to flip discs so that the opposite side is in contact with the floor.
4. **Switch control:** Your robot must flip a series of switches to match a code revealed by your designated official observer.

MISSION CONSTRAINTS:

- Robot must be controlled remotely.
- All team members must control the robot at least once during testing.
- A task is considered “completed” when it passes inspection by an official observer.

MISSION CRITERIA (ACHIEVEMENTS):

- Each team member completes at least one task (minimum criteria for success).
- Each team member completes all tasks in a single run.
- Team completes each task at least once.
- Team completes all tasks in a single run.
- Team completes all tasks in under 2 minutes

MISSION ACHIEVEMENTS:

- Each team member completes at least one task (minimum criteria for success).

	Team member 1	Team member 2	Team member 3	Team member 4
Traverse multiple terrains				
Debris removal				
Search and rescue				
Switch control				

- Each team member completes all tasks in a single run.

	Team member 1	Team member 2	Team member 3	Team member 4
Traverse multiple terrains				
Debris removal				
Search and rescue				
Switch control				

- Team completes each task at least once.

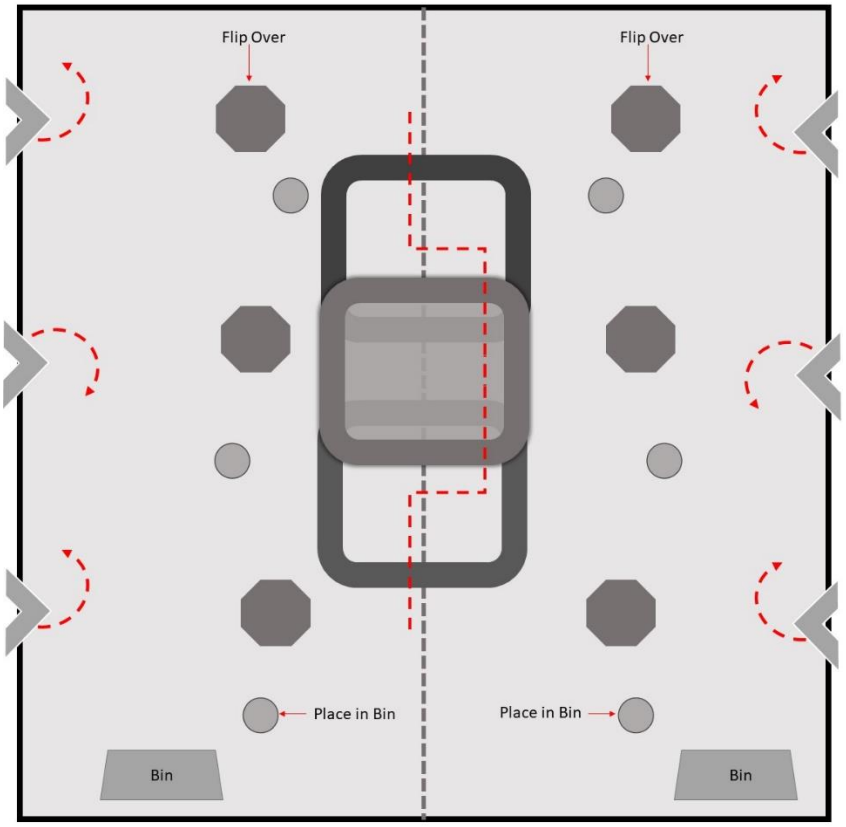
	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	

- Team completes all tasks in a single run.

	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	

- Team completes all tasks in under 2 minutes.

	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	



STEM on the Ground Final Challenge:
Department of Defense Request for Proposal

The *Department of Defense (DOD) Request for Proposal* requires cadets to create a multi-purpose robot that will be able to complete a variety of different types of tasks in a single test. The final challenge will be completed over two days and four sessions. The first two sessions focus on planning, creating, testing, improving and evaluating robot redesigns. The third and fourth sessions focus on communicating results and preparing presentations to be shared with Academy special guests and program sponsors. The first three sessions take place on Thursday afternoon and evening, followed by time for the cadets to enter responses in their reflection journals. The fourth session takes place on Friday morning prior to the arrival of the special guests for the presentations and Awards Luncheon. Teams will create large communication posters and prepare a 2-3 minute oral and audio-visual presentation that will include using their tablets to show videos and photos of their robot designs and achievements.

Supporting Disassembly of Robots:

At the beginning of Session 3, instructors will use mission and general achievement records to choose one team per platoon to demonstrate their robots on the testing field for special guests during the formal poster presentation on the final day. Before the end of Session 3, all other teams should begin disassembling their robots, sorting and bagging up the various materials. If teams are not able to finish disassembling their robots during Session 3, instructors will need to help them complete this process during Session 4 and before the guests arrive for the poster presentations the following morning. Following the presentations, Academy staff will need to disassemble the robots used for the demonstrations.

Teams should have an instructor inspect the kit to be sure they have packed it neatly so all items can fit (with the lid on).

Session 1: Designing a Multi-Purpose Robot

THURSDAY (2:30-5:30PM ALL PLATOONS)

Overview

This final challenge will require cadets to apply what they have learned in Challenges 1 and 2 to design and build a robot to complete specific tasks communicated through the *Department of Defense Request for Proposal,* i.e., the Mission Brief. Teams will be allowed to change their robot's structure and maneuverability to complete various mission achievements. In this first session, teams will plan, create, and test a new, more complex robot capable of completing specific tasks (mission achievements) required in the DOD Proposal. They will also begin testing for these mission achievements in this session.

Important Vocabulary

- Request for Proposal

Learning Outcomes

- Cadets will be able to utilize the Engineering Design Process and knowledge gained from the previous STEM Challenges to complete the design of a robot to meet given criteria under given constraints.
- Cadets will be able to compute the gear ratio of any gear systems within the robot design.

Materials and Set Up

Instructional Materials:

- Index cards
- 2 Instructor Tablets (1 per platoon)
- Laptop with LCD projector on media cart with speakers or sound system
- VEX field (empty of all obstacles)
- Materials for Testing
  - 3 balls
  - 3 Vex disks
  - 3 Vex flags (each on a pole)
  - 3 Vex platforms (shared between half fields)

Per Table:

- 1 Table Kit
- Sheets of blank paper

Per Team:

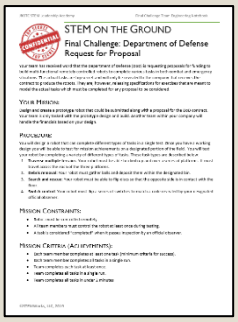
- 1 Tablet (charged, OneNote app)
- VEXNet Kit (including Clawbot constructed in previous challenge)

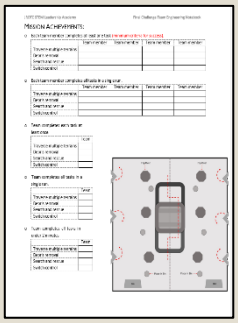
Per Cadet

- Page 1 of Mission Brief Handout

Instructional Plan:

DoD Challenge Introduction: (10 min)


STEM ON THE GROUND
Final Challenge: Department of Defense Request for Proposal



Introduce the *Department of Defense* Challenge by giving each cadet a copy of page 1 of the **Mission Brief (Request for Proposal)**. Let cadets know that industries often will send out a **Request for Proposal** (sometimes called a RFP**)** to solicit proposals from individuals or groups to produce a specialized technology or product needed by the industry but they do not have the qualified staff to develop. Allow time for cadets to read it and write any questions on the back of the handout. Start a discussion of the challenge by clarifying any questions about the criteria and constraints of the challenge.

MISSION CONSTRAINTS

- Robot must be controlled remotely.
- All team members must control the robot at least once during testing.
- A task is considered "completed" when it passes inspection by an official observer.

MISSION CRITERIA (ACHIEVEMENTS)

- Each team member completes at least one task (minimum criteria for success)
- Each team member completes all tasks in a single run
- Team completes each task at least once
- Team completes all tasks in a single run
- Team completes all tasks in under 2 minutes

Be sure teams have a clear idea of the different types of tasks to be completed. Open the instructor version of the Notebook and display the field diagram on **page 3** of the TEN. Use the diagram to help clarify each task.

1. **Traverse multiple terrains:** Your robot must be able to climb up and over a series of platforms. It must travel across each of the three platforms.
2. **Debris removal:** Your robot must gather balls and deposit them within the designated bin.
3. **Search and rescue:** Your robot must be able to flip discs so that the opposite side is in contact with the floor.
4. **Switch control:** Your robot must flip a series of switches to match a code revealed by your designated official observer.

Tell cadets they can access this diagram, if needed, when they plan their new robot design. Conclude this discussion by telling teams that their Mission Achievements will be tracked using the same procedures as was followed in Challenges 1 and 2. Also remind teams that instructors are still observing for General Achievements.

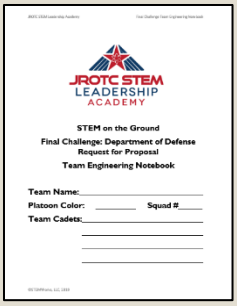
PLAN AND CREATE (65 min):

After answering questions about the Mission Brief, take no more than 10 minutes to lead a group discussion to remind teams of research investigations completed earlier in the week. Have teams share ideas about how they could apply what they learned in the previous challenges to be successful in this challenge. Listen for and emphasize the following ideas:

- The position of the wheels on the drivetrain can impact turning radius and turning scrub, making the robot easier or harder to drive.
- Gears should be used strategically on wheels and robot arms. The inverse relationship of rotational speed of the gears and lifting force means teams may need to consider trade-offs.
- Different types of manipulators are better choices for certain tasks, so a multipurpose robot may need more than one type.

Before teams start their planning process, briefly explain how the remaining time before dinner will be used. Teams will have 15 minutes to Plan their design and record their plan in the TEN. They should have an instructor approve their plan before moving into the Create phase and constructing their initial design. Teams will have a maximum of 40 minutes to construct their first design, and then Testing for achievements will begin. As in previous challenges, teams will document their testing and redesign process in their TEN. Finally, tell teams that they should record short videos and take pictures of their designs as they will use these clips and pictures in a more formal communication activity on the last day of the Academy. These pictures and videos should be stored in TEN of the Notebook. They may add pages to the Final Challenge tab as needed.

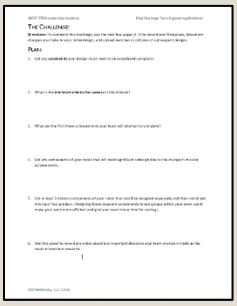
> **Note**: Do not take time now to describe tomorrow's presentations. That discussion occurs in Session 3. FYI - not all teams will be able to display their robots for tomorrow's visitors, so it is important that now they use their tablets to take pictures of various design and to show how their robot performed.


JROTC STEM LEADERSHIP ACADEMY

STEM on the Ground
Final Challenge: Department of Defense
Request for Proposal
Team Engineering Notebook

Team Name:_____
Platoon Color: _____ Squad #____
Team Cadets:_____

Have teams open the TEN for the Final Challenge and fill out the **cover page**. Tell cadets they can refer back to **pages 2-3** to review the details of the Mission Brief as needed. However, for now, they will skip over those pages and move directly into the Planning phase using **page 4.** Instruct teams to take approximately 15 min to complete **numbers 1-6** on this page as these prompts will help them with the planning process.



Monitor teams' progress while they complete this information. Once teams have completed this page and an instructor has approved their work, they can begin building their design. Give teams a 5-minute warning to be sure teams move to the building phase after 15 minutes. Help any teams that are lagging behind make quick, final decisions so they can begin building. Encourage teams to identify different components of their design that could be built by sub-groups within a team. Give teams about 40 minutes to redesign and build their robot before formal testing will take place.

Use this time to construct the testing field and set up the Mission Achievements central record.

Using the Mission Achievements central record:

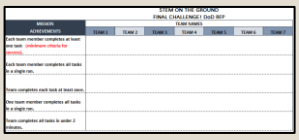
Go to the Content Library and open the Mission Achievements tab.

Click on the Excel sheet icon (located just above the displayed table). This will open the fillable achievements worksheet.

Record each team's name at the top of each column (one column will be used to track achievements for each team).

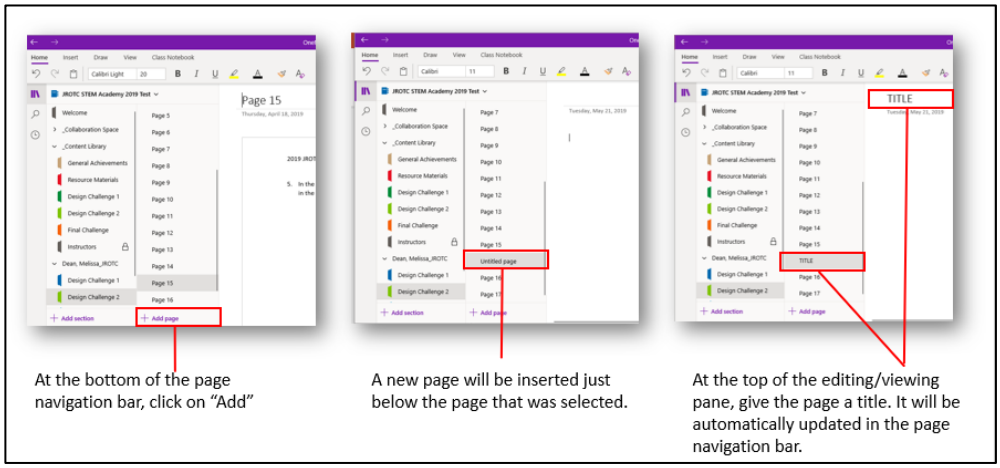
Keep the Excel sheet open and be ready to record achievements in this file.

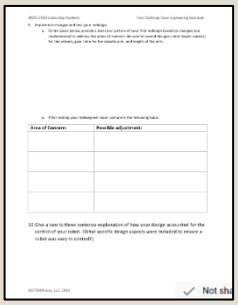
Place an X in the cells as teams make achievements.



Test, Improve, Redesign and Retest (85 min):

Once the field is set up identify the instructor who will serve as the observer and timekeeper. Once the Mission Achievement central record is prepared, display the Mission Achievements page in the Content Library of the instructor version of the Notebook. As teams complete constructing their initial design, have them upload a picture or sketch in **number 7** on **page 5** of their TEN and then move to the testing field. Teams should take their robot, controller, and tablet to the field. They should complete **number 8** on **page 5** and then begin the iterative process of redesigning and testing, documenting their process in **numbers 9-11** on **pages 6-7.** Remind cadets that additional pages can be added to their Notebook if they need more space to record multiple redesigns.





Move among teams to observe for application of knowledge and possible points of frustration. Double check that teams are documenting redesign ideas in the TEN and providing explanations using appropriate vocabulary. Use this opportunity to discuss the importance of learning through failure and making improvements based on both successful and unsuccessful designs. Encourage teams to brainstorm solutions and reach consensus on a plan before implementing an adjustment.

Facilitate the testing process. Only one team should be allowed to test per half-field. An instructor will monitor each half-field to act as observer and timer as necessary. If a line forms around the testing field, instructors should give priority to teams that need to test for the minimum criteria of success. Like Challenge 1 and Challenge 2, use the Mission Achievements record to allow the ballroom to see the relative progress of all teams. You may also choose to switch between displaying the General Achievements central record and the Mission Achievements.

Wrap-up & Nomination of Squad Leaders to serve on Interview Panel (20 min):

Wrap-Up (10 min). With approximately 20 min left in this session have teams return to their workstations and begin organizing materials. Explain that testing will continue after dinner, but the challenge ends this evening. Robots should be left as they are for

testing to continue in Session 2 after dinner. Teams should place any loose materials in the proper containers and check their tablet and robot batteries for level of charge. Tablets should be returned to the storage shelves before teams leave the ballroom.

Nomination of Squad Leaders to serve on Interview Panel (10 min). Congratulate all teams on their persistence in tackling the previous two challenges and on their progress so far in the Final STEM Challenge. Point out that throughout the challenges teams exhibited significant teamwork and leadership skills.

At this time, each Squad needs to ***nominate*** two cadets who the Squad believes have best exhibited strong leadership and teamwork traits throughout the Academy – not only while solving the STEM Challenges, but during all of the Academy's activities (e.g., industry and educational field trips, physical fitness exercises). It is important that their nominees are good communicators who can share their thoughts in a clear and concise manner so that others who have not participated in the Academy would understand. Let Squads know that ***some*** of these nominees will be selected to serve on a panel during the Awards Luncheon and, through a question & answer process, the selected cadets will get to share his/her perspectives on this summer's STEM Academy and what experiences have meant the most to them.

Ask Squads to move their seats (or just cluster around one tablet) to reach consensus on two nominees. Pass out 1 index card to each squad. Cadets should write their platoon color, squad number, and the names of each nominated cadet on a card. They should then give the cards back to instructors.

Tell the nominated cadets that before the end of tonight's session, Cadre will inform cadets if they have been selected to be on the panel and will give further instructions to those selected for the interview panel. Be sure cadets understand that this is a low-pressure panel and that they will help decide what questions will be asked and will have time to think about responses.

Note: As soon as the nominations have been completed, STEM Instructors need to give the Academy Coordinator an index card with their ranking of the 2 nominees for each Squad including the following information on each**: Cadet's name, High School, Platoon and Squad Number, Gender and Ethnicity.** Instructors should also share any major concerns they have about any nominee (e.g., behavior problems) with the Academy Coordinator.

Academy Staff Leaders will make the final selections in an effort to provide a diverse panel representing as many schools as possible. The Academy Leaders will convey the final selections to the Cadre who will inform cadets of their selection (or not) and give instructions to the selected cadets. Those cadets selected need to meet Dr. Pruet outside the Academy Office for additional information before leaving tonight.

Session 2: Test, Redesign, Evaluate

THURSDAY (6:30-7:45PM ALL PLATOONS)

Overview

This session is a continuation of Session 1. During the second session, teams will have the opportunity to cycle through improving, testing and redesigning their robot to maximize its performance in achieving the mission achievements. The session will close with teams evaluating and drawing conclusions about their design's overall performance and thinking about future improvements.

Important Vocabulary

No new vocabulary

Learning Outcomes

- Cadets will be able to utilize the Engineering Design Process and knowledge gained from the previous STEM Challenges to complete the design of a robot to meet given criteria under given constraints.
- Cadets will be able to compute the gear ratio of any gear systems within the robot design.

Materials and Set Up

Instructional Materials:

- 2 Instructor Tablets (1 per platoon)
- Laptop with LCD projector on media cart with speakers or sound system
- VEX field (with materials placed in field according to diagram)
- Materials for Testing
  - 3 balls
  - 3 Vex disks
  - 3 Vex flags (each on a pole)
  - 3 Vex platforms (shared between half fields)

Per Table:

- 1 Table Kit
- Sheets of blank paper

Per Team:

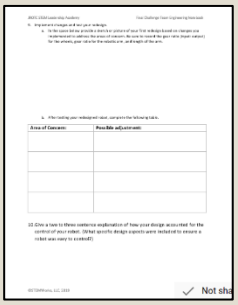
- 1 Tablet (charged, OneNote app)
- VEXNet Kit (including robot constructed in previous challenge)

Instructional Plan:

CONTINUE TESTING FOR ACHIEVEMENTS (60 mins):

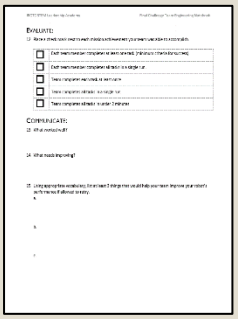
As teams enter the ballroom, have one team member retrieve the team tablet from the storage shelves. Begin this session by displaying the Mission Achievements central record and reminding teams to use **pages 6-7** of their TEN to record their subsequent redesigns and tests. Inform teams that they will have approximately 1 hour to complete any additional mission achievements. Procedures will remain the same as in Session 1.

During this time, Cadre should notify the nominated cadets whether or not they were chosen to be on the interview panel during tomorrow's Academy celebration. Be sure they know that to be nominated by their peers is an honor, but the panel can only include one representative per squad. The selected cadets should be told to meet Dr. Pruet outside of the Academy Office immediately following tonight's session for final instructions, including that they will need to meet with Dr. Pruet *again* during breakfast to plan the questions for the interviews.



CLEAN UP MATERIALS: (7 mins)

With about 15 minutes remaining for this session, have teams return to their workstations, return loose materials to the proper container, and neatly organize their materials bin, electronics box, and robot. The next activity will introduce them to the communication phase of the Final Challenge so they will need space to work.



EVALUATE FINAL DESIGNS: (8 mins)

Have teams turn to **page 8** in their **TEN** and give cadets a few minutes to reflect on what features of their final design worked well and what they would do to make improvements if they had more time. After approximately 5 minutes, lead a whole group discussion about how teams used what they learned in their investigations to redesign their robots to complete the different mission achievements. Note any particularly interesting designs and recognize those teams that persevered through failures or frustrations. Highlight all teams that met the minimum criteria for success and any teams that completed all mission achievements.

Conclude this lesson by announcing to the squads which of their nominees were selected to serve on the Academy Cadet Leaders Interview Panel tomorrow. Congratulate all nominees for being recognized by their peers as exemplary leaders this past week. Ask the cadets selected to gather outside the Academy office tonight before leaving to receive more information.

Session 3: Preparing to Communicate

THURSDAY (7:45-8:30PM ALL PLATOONS)

Overview

This short session will introduce the poster session communication activity and give cadets time to begin planning for their poster design and oral presentation to communicate what they learned and how they applied that knowledge to the final engineering design challenge. While discussing plans for the poster, most teams will need to disassemble their robot and place all parts back in the correct bags and containers. Instructors will use mission and general achievement records to choose one team per platoon to demonstrate their robot during the formal poster presentation for the special guests. These will be the only teams who will not disassemble their robots.

Important Vocabulary

No new vocabulary

Learning Outcomes

- Cadets will be able to create a poster to communicate the mathematics and science knowledge they used to address the challenge.
- Cadets will be able to deliver a brief presentation to explain how they applied the engineering design process to meet the design challenge.
- Cadets will be able to use appropriate vocabulary to explain how the robot was designed and why it performed the way it did.

Materials and Set Up

Instructional Materials:

- 2 Instructor Tablets (1 per platoon)
- Laptop with LCD projector on media cart with speakers or sound system
- VEX field (with obstacles placed according to the field diagram)

Per Table:

- 1 Table Kit
- Sheets of blank paper

Per Team:

- 1 Tablet (charged, OneNote app)

INSTRUCTIONAL PLAN:

PREPARE FOR FORMAL COMMUNICATION (20 min):

Explain that one of the most important steps of the engineering design process is communication where you describe results and make recommendations, usually to the person who hired you to design the prototype. Tell teams they will plan, develop, and present a "Final Challenge Brief." This Brief will be used during the Academy celebration to inform guests about what they have learned over the week and how they applied their knowledge to solve this challenge.

Tell cadets to turn to **pages 9-10** in their **TEN** to learn more about what is expected in the Brief. Use the instructor version of the Notebook to display the criteria for the Brief. After giving teams a few minutes to read through the directions, review the criteria for the Brief.

CRITERIA FOR PRESENTATION BRIEF

1. An explanation of how you used the Engineering Design Process to solve this challenge.
2. A picture/sketch or video of your different designs (with labels).
3. A brief explanation of the science and mathematics content you applied to solve this challenge.
4. A picture/sketch or video of FINAL design.
5. The test results and recommendations for how you might continue to improve your design.

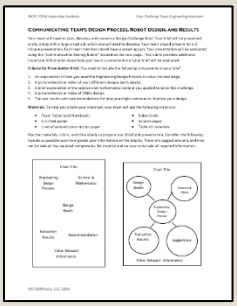
In addition, teams should plan to give a 2 to 3-minute oral presentation to any guests that come to their posters. Each team member should have a speaking part. Refer to the Communication Rubric on **page 10** in the **TEN** and review with cadets once again the important vocabulary and learning outcomes reviewed at the beginning of the final challenge. Encourage them to incorporate this information into their presentation. Explain the Communication Rubric should be used as a guide to self-evaluate the quality of their poster and planned presentation.

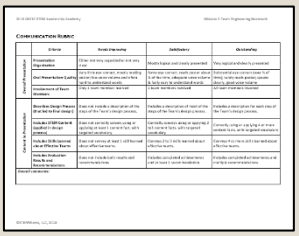
Let teams know that they will have limited time in the morning to make their presentation boards and to practice their oral presentations with other teams, so now is the time to discuss ideas and make decisions for their presentation. Give cadets the remaining time to start brainstorming and planning their poster and what they want to say in their presentation. Scratch paper can be used by teams to record their ideas. Teams may also add pages to their TEN to take notes.

Disassemble Robots & Continue Planning (20 min)

After teams have been planning for about 20 minutes, and you see that all team members are contributing to the planning process, announce to teams that two teams (one per platoon) will get to actually demonstrate their robots during the presentations.

Announce which teams will showcase their robots during tomorrow's presentations. Give a brief explanation of how this team was selected. Instruct the remaining teams to





Note: Be sure that cadets are meaningfully contributing to the planning process even though they may be taking apart the robot. Both tasks need to be completed by the end of this session, and we think cadets can "multi-task." Monitor teams to help them be successful with both tasks.

continue planning but also to begin to disassemble their robot and return materials to the proper containers. Teams should remove the batteries from the controller and place them in the electronics box. The selected teams whose robots will be used in the demonstrations tomorrow should also use this time to organize any unused materials and ensure that there is a place for their robot's materials once it is disassembled tomorrow. These teams should plug their robot's battery into a charging station. Be sure these teams use a sticky note to label their batteries.

No teams should be allowed to drive their robot during this time.

WRAP-UP (5 MIN):

With the few minutes remaining for the lesson, have teams stop disassembling and organize these materials as best as they can for now. They can finish disassembly and organizing their kits tomorrow morning while other team members start creating the poster. The teams who will be showcasing their robots should be sure to charge the robot battery and all other kit materials should be well organized and stored. All teams should ensure their tablets are sufficiently charged for tomorrow's presentations. Teams should identify 1 team member to keep all their planning notes or they can choose to neatly stack their notes and leave them at their workstation.

Electronic Journal Reflections

Thursday (8:30pm-9:00pm All Platoons)

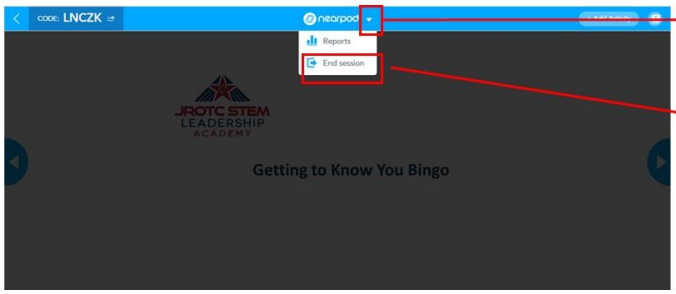
Tell cadets today's final activity is to reflect on what they have learned today using their electronic journals. Have cadets retrieve their individual tablets from the storage shelf while you pull up the NearPod lesson.

To re-open a lesson, hover over the lesson thumbnail and select the "Live Lesson" option. A smaller window will pop-up which gives you the option to "Resume" a lesson. To retrieve your saved lesson, follow the instructions below. The lesson should open to the last slide you displayed (Slide #36).

Display **Slide #37** and direct cadets to login to the Nearpod lesson by opening the application on their tablets and entering the lesson code. When cadets have all logged into the lesson successfully, have cadets respond to the first question on **Slide #38**, explaining that each question should be answered within *4 minutes time*. Each of the reflection slides has a 4 minute 15 second timer. When time is up, move to the next slide. Repeat this process until **Slides #38-41** are complete. Use the instructor view of NearPod to monitor cadet answers. You may decide to stay on a slide for longer than the allotted time if you see that cadets need more time to record their answer.

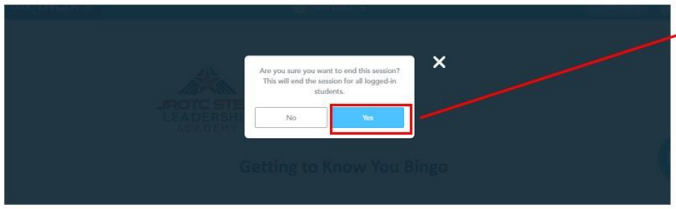
Remind cadets that NearPod allows us to provide individual reports to cadets that include all of their journal reflections and Winning Color results. We can email these reports to cadets who are interested in keeping this information. Display **Slide #42** and tell cadets they can sign-up to receive their personal report by submitting their first/last name and email address on this slide. Those cadets who do not want to receive their personal report should not respond to this slide at all.

When all reflection prompts have been answered, END the session. Use the diagram below to help you follow the correct steps.



Click on the down arrow to the right of the NearPod logo at the top, center of your screen.

Then click on "End session"



A confirmation window will automatically pop-up. Click on "Yes" to end the session.

This will save all of the journal reflection data collected over the week.

Session 4: Communicating Results

FRIDAY (8:30-11:00AM ALL PLATOONS)

Overview

This final session of the challenge will emphasize the importance of communication. Teams will work together to create a poster presentation as their Final Challenge Brief. Teams will have a chance to practice their presentations with other teams before making their formal 2-3 minute presentations to the special guests invited to attend today's Awards Luncheon.

Also, during this session, one squad at a time will leave for 30 minutes to take the Academy post-test.

Learning Outcomes

- Cadets will be able to create a poster to communicate the mathematics and science knowledge they used to address the challenge.
- Cadets will be able to deliver a brief presentation to explain how they applied the engineering design process to meet the design challenge.
- Cadets will be able to use appropriate vocabulary to explain how the robot was designed and why it performed the way it did.

Materials and Set Up

Instructional Materials:

- 2 Instructor Tablets (1 per platoon)
- Laptop with LCD projector on media cart with speakers or sound system
- VEX field (prepared for demonstrations)
- Timing device (personal cell phone)

Per Table:

- 1 Table Kit
- Sheets of blank paper
- Sheets of multi-color construction paper
- Index cards

Per Team:

- 1 Tablet (charged, OneNote app)
- VEXNet Kit (to complete disassembly; should be turned in to Academy when complete)
- 1 Tri-fold poster
- Communication Rubric Handout

Planning Logistics of the Poster Session & Demonstration:

Plan for the Poster Session-work with the other Instructor in your ballroom to consider and plan for the poster session. Teams from both platoons will participate in a practice poster session with another team using the Communication Rubric to receive feedback and improve their posters and their team presentation.

Posters should be arranged on the tables so that teams can stand in front of their posters and talk with visitors (and other teams) as they walk around the room. If table space is not available for all posters, identify additional locations in the ballroom to arrange posters and teams. Each team will need to have their poster, notecards, and team tablet.

Plan for Demonstrations – Decide how selected teams will demonstrate their robot designs as part of their presentation while visitors are present. All teams should display pictures of their prototype on their tables, but only two teams (1 per platoon) will operate their robot during this time.

VEX Kit Clean Up

Except for the two teams demonstrating their robots, all teams should have completely disassembled their robots and returned all items to the proper materials box (building parts versus electronic parts) prior to the beginning of the guest presentations. Batteries should be removed from each controller and placed in the electronics box.

After the celebration, staff will help disassemble the remaining 2 robots in each ballroom and return all items to their proper places in each kit.

Instructional Plan

Prepare for Communication and Complete Post-Assessment (100 min):

As cadets enter the room, have them retrieve their team tablets and notes. Display **pages 9-10** of the instructor TEN and remind teams to use **pages 9-10** of their **TEN** as a guide for designing a high-quality communication poster and presentation. Refer to the sample poster diagrams in their TEN if teams need some guidance on how to organize the information. Tell teams they will have about an hour to complete their posters and practice their presentations. Encourage cadets to record their talking points on index cards.

> Note: Teams will be interrupted during the preparation time to complete the post JROTC STEM Leadership Academy post-test and questionnaire. Cadets will complete the assessment by squad, rotating out of the ballroom in turns. This activity may take up to 30 minutes for each squad. So, teams will really have about 70 minutes to develop their posters and presentations.

Allow cadets to spread out in the room to begin designing their posters and writing up notes to help them with their presentation. Have the two teams who will be demonstrating their robots, place the robot and controller inside the testing field so these items will not get in the way of creating their poster.

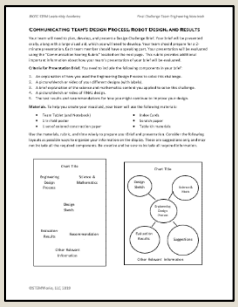
If any teams have not fully disassembled their robot, they should also complete this task. When teams are finished with their kits, they should notify an instructor who can inspect it and then store the kits in a central location to be picked up by the Materials Manager. This will also provide teams with more room to put together and set up their posters.

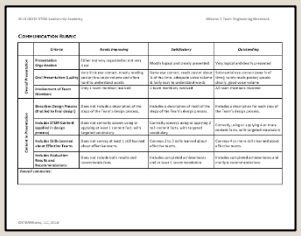
Practice Communicating Results: (35 min)

Direct teams to put away all unused presentation materials and display their posters in the designated areas of the room. Either gather these materials or have cadets return them to a central location in the room. Teams should keep their team tablet with them. Be sure to space the Briefs so that one team can cluster around their poster while another team listens to the presentation. Pass out one "**Communication Rubric" handout** to each team.

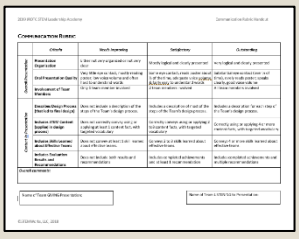
Explain that now teams will have a chance to practice their presentation and evaluate their communication poster with another team in the ballroom through a practice poster session. Emphasize that poster sessions are a little different from other types of presentations in that people are usually walking around and discussing the information on the visual aid and the general project in a more informal way. However, it is the responsibility of each team to make sure visitors coming up to them walk away with a clear picture of the challenge, how their team addressed the challenge, and how they used the mathematics and science content in this challenge.

In coordination with the other instructor in the ballroom, briefly explain how teams will pair up to evaluate each other's posters. Teams will take turns being the listeners and the presenters. Be sure to cadets understand:





Materials Managers will need to confirm kits have been put back to their original state and move all (except for the two kits of the teams selected to demonstrate their robots) to the Academy Office BEFORE teams begin the Practice Communicating Results Activity.



- One team will start off as the Presenters. These teams will station themselves around their posters and tablet (which will likely display images of their robot designs).
- The other team will start off as the Listeners. Each Listening Team will start the activity at one of the Presenting Team's posters (1 Listening Team per 1 Presenting Team).
- The Presenting team should give their **"Communication Rubric Handout,"** to the Listening team. The Listening team will record the team names at the bottom of the handout.
- When an instructor says begin presentations, the two teams can interact more casually, understanding that the goal is to give the Presenting Team a chance to practice talking about how they addressed the engineering design challenge (about 2 minutes) and allowing time (about 2 minutes) to respond to questions posed by the "Listening Team."
- After about 4 minutes, an instructor will signal all to stop and direct the listening teams to complete a "**Communication Rubric Handout"** for the Presenting Team. They should circle the cell that best represents the Presenting Performance for each criterion row. While the Listening Team completes the rubric, the Presenting Team should discuss ways to improve their presentation. After 2 minutes the Listening Team will give the completed rubric back to the Presenting Team.
- Instructors will direct Teams to switch roles and repeat the process.

Encourage teams to use the scores on their rubrics as feedback to help them make their presentations better before the Academy's special guests arrive.

Prepare for Formal Presentations and Demonstrations (15 min)

Once teams have had a chance to practice, tell them they are now going to make final plans to present for guests who will attend the Academy celebration. This is their opportunity to show people what they have learned over the week and how they used their knowledge to solve this engineering design challenge. Remind cadets that several of the guests help to financially support the Academy, so it is important for these guests to know how much the cadets value their investment.

Use this time to begin cleaning up the instructional materials and being sure the rooms are ready for the guests. Work with the Materials Manger to be sure s/he has all the VEX kits.

STEM on the Ground

Final Challenge: Department of Defense Request for Proposal

Team Engineering Notebook

Team Name:_____

Platoon Color: _____ **Squad #**_____

Team Cadets:_____

_____

_____

_____

STEM ON THE GROUND

Final Challenge: Department of Defense Request for Proposal

Your team has received word that the Department of Defense (DoD) is requesting proposals for funding to build multi-functional remotely controlled robots to complete various tasks in both combat and emergency situations. The actual tasks are top secret and will only be revealed to the company that receives the contract to produce the robots. They are, however, releasing specifications for exercises that are meant to model the actual tasks which must be completed for any proposal to be considered.

YOUR MISSION:

Design and create a prototype robot that could be submitted along with a proposal for the DoD contract. Your team is only tasked with the prototype design and build. Another team within your company will handle the financials based on your design.

PROCEDURE:

You will design a robot that can complete different types of tasks in a single test. Once you have a working design you will be able to test for mission achievements on a designated portion of the field. You will test your robot by completing a variety of different types of tasks. These task types are described below:

1. **Traverse multiple terrains:** Your robot must be able to climb up and over a series of platforms. It must travel across the each of the three platforms.
2. **Debris removal:** Your robot must gather balls and deposit them within the designated bin.
3. **Search and rescue:** Your robot must be able to flip discs so that the opposite side is in contact with the floor.
4. **Switch control:** Your robot must flip a series of switches to match a code revealed by your designated official observer.

MISSION CONSTRAINTS:

- Robot must be controlled remotely.
- All team members must control the robot at least once during testing.
- A task is considered “completed” when it passes inspection by an official observer.

MISSION CRITERIA (ACHIEVEMENTS):

- Each team member completes at least one task (minimum criteria for success).
- Each team member completes all tasks in a single run.
- Team completes each task at least once.
- Team completes all tasks in a single run.
- Team completes all tasks in under 2 minutes

Mission Achievements:

- Each team member completes at least one task (minimum criteria for success).

	Team member	Team member	Team member	Team member
Traverse multiple terrains				
Debris removal				
Search and rescue				
Switch control				

- Each team member completes all tasks in a single run.

	Team member	Team member	Team member	Team member
Traverse multiple terrains				
Debris removal				
Search and rescue				
Switch control				

- Team completes each task at least once.

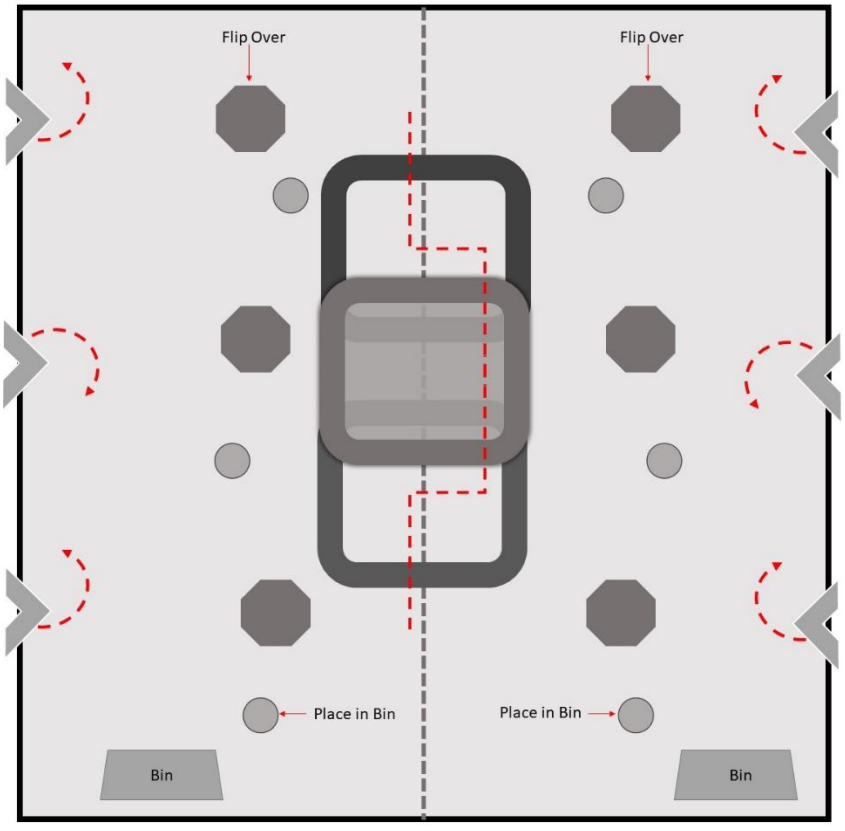
	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	

- Team completes all tasks in a single run.

	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	

- Team completes all tasks in under 2 minutes.

	Team
Traverse multiple terrains	
Debris removal	
Search and rescue	
Switch control	



THE CHALLENGE:

Directions: To complete this challenge, use the next few pages (4-7) to record your final plans, document changes you make to your initial design, and upload sketches or pictures of subsequent designs.

PLAN:

1. List any **constraints** your design must meet to be considered compliant.

2. What is the **minimum criteria for success** in this mission?

3. What are the first three achievements your team will attempt to complete?

4. List any components of your robot that will need significant redesign due to the change in mission achievements.

5. List at least 2 distinct components of your robot that could be designed separately and then combined into your final product. (Assigning these separate components to sub-groups within your team could make your work more efficient and give your team more time for testing.)

6. Use this space to record any notes about any important decisions your team members made as the result of previous research.

CREATE:

7. In the space below provide a sketch or picture of your initial robot design and record the gear ratio (input: output) for the wheels, gear ratio for the robotic arm, and length of the arm.

TEST, IMPROVE, REDESIGN AND RETEST:

8. Describe what you observed during your first "in the field" test of your robot.
    a. List at least two aspects of your robot that met the expectations developed during the design process.

    b. List at least two aspects of your robot that could be improved (i.e., stability, control, lifting force, speed…). Include possible adjustments to fix these areas of concern.

Area of Concern:	**Possible adjustment:**

9. Implement changes and test your redesign.
    a. In the space below provide a sketch or picture of your first redesign based on changes you implemented to address the areas of concern. Be sure to record the gear ratio (input: output) for the wheels, gear ratio for the robotic arm, and length of the arm.

    b. After testing your redesigned robot, complete the following table.

Area of Concern:	Possible adjustment:

10. Give a two to three sentence explanation of how your design accounted for the control of your robot. (What specific design aspects were included to ensure a robot was easy to control?)

11. Use this page to record notes about each subsequent test. Include problems that you observed during testing as well as adjustments you made to overcome those problems. You should also note any adjustments you made in order to complete different mission achievements and provide a new sketch or picture. Don't forget record the gear ratio (input: output) for the wheels, gear ratio for the robotic arm, and length of the arm

Photo or Sketch	Target Mission Achievement	Notes about Gear Ratios & Arm Length	Notes about Performance and Adjustments

EVALUATE:

12. Place a check mark next to each mission achievement your team was able to accomplish.

- ☐ Each team member completes at least one task (minimum criteria for success).
- ☐ Each team member completes all tasks in a single run.
- ☐ Team completes each task at least once.
- ☐ Team completes all tasks in a single run.
- ☐ Team completes all tasks in under 2 minutes

COMMUNICATE:

13. What worked well?

14. What needs improving?

15. Using appropriate vocabulary, list at least 3 things that would help your team improve your robot's performance if allowed to retry.
    a.

    b.

    c.

Communicating Team's Design Process, Robot Design, and Results

Your team will need to plan, develop, and present a Design Challenge Brief. Your brief will be presented orally, along with a large visual aid, which you will need to develop. Your team should prepare for a 2-minute presentation. Each team member should have a speaking part. Your presentation will be evaluated using the "Communication Scoring Rubric" located on the next page. This rubric provides additional important information about how your team's presentation of your brief will be evaluated.

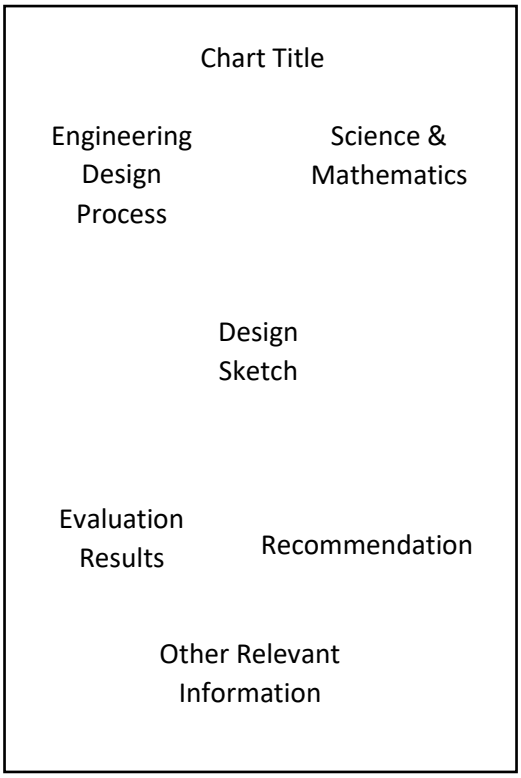
Criteria for Presentation Brief. You need to include the following components in your brief:

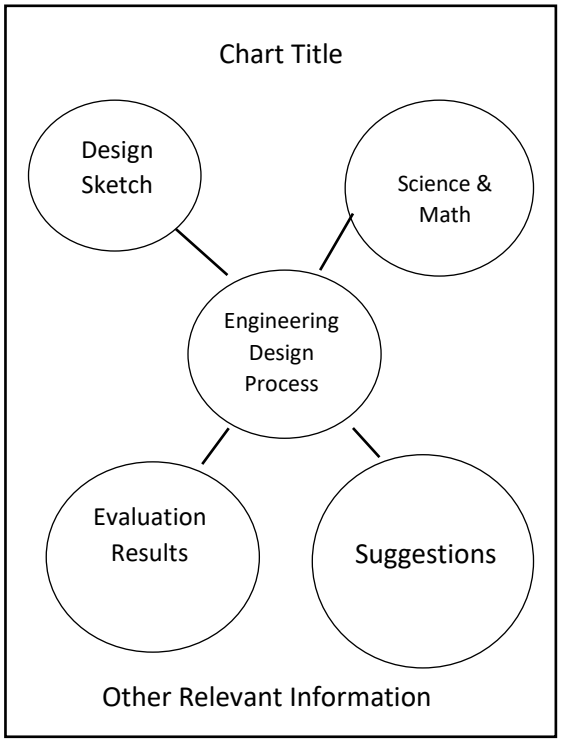
1. An explanation of how you used the Engineering Design Process to solve this challenge.
2. A picture/sketch or video of your different designs (with labels).
3. A brief explanation of the science and mathematics content you applied to solve this challenge.
4. A picture/sketch or video of FINAL design.
5. The test results and recommendations for how you might continue to improve your design.

Materials. To help you create your visual aid, your team will use the following materials:

- Team Tablet (and Notebook)
- 1 tri-fold poster
- 1 set of colored construction paper
- Index Cards
- Scratch paper
- Table kit materials

Use the materials, rubric, and time wisely to prepare your Brief and presentation. Consider the following layouts as possible ways to organize your information on the display. These are suggestions only and may not include all the required components. Be creative and be sure to include all required information.





COMMUNICATION RUBRIC

	Criteria	*Needs Improving*	*Satisfactory*	*Outstanding*
Overall Presentation	**Presentation Organization**	Either not very organized or not very clear	Mostly logical and clearly presented	Very logical and clearly presented
	Oral Presentation Quality	Very little eye contact, mostly reading poster; low voice volume and often hard to understand words	Some eye contact; reads poster about ½ of the time, adequate voice volume & fairly easy to understand words	Substantial eye contact (over ½ of time), rarely reads poster; speaks clearly, good voice volume
	Involvement of Team Members	Only 1 team member involved	2 team members involved	All team members involved
Content In Presentation	**Describes Design Process (that led to final design)**	Does not include a description of the steps of the Team's design process.	Includes a description of most of the steps of the Team's design process.	Includes a description for each step of the Team's design process.
	Includes STEM Content (applied in design process)	Does not correctly convey using or applying at least 1 content fact, with targeted vocabulary	Correctly conveys using or applying 2 to3 content facts, with targeted vocabulary	Correctly using or applying 4 or more content facts, with targeted vocabulary
	Includes Skills Learned about Effective Teams	Does not convey at least 1 skill learned about effective teams.	Conveys 2 to 3 skills learned about effective teams.	Conveys 4 or more skills learned about effective teams.
	Includes Evaluation Results and Recommendations	Does not include both results and recommendations	Includes completed achievements and at least 1 recommendation	Includes completed achievements and multiple recommendations
Overall comments:				

COMMUNICATION RUBRIC

	Criteria	*Needs Improving*	*Satisfactory*	*Outstanding*
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Content In Presentation	**Describes Design Process (that led to final design)**	Does not include a description of the steps of the Team's design process.	Includes a description of most of the steps of the Team's design process.	Includes a description for each step of the Team's design process.
	Includes STEM Content (applied in design process)	Does not correctly convey using or applying at least 1 content fact, with targeted vocabulary	Correctly conveys using or applying 2 to3 content facts, with targeted vocabulary	Correctly using or applying 4 or more content facts, with targeted vocabulary
	Includes Skills Learned about Effective Teams	Does not convey at least 1 skill learned about effective teams.	Conveys 2 to 3 skills learned about effective teams.	Conveys 4 or more skills learned about effective teams.
	Includes Evaluation Results and Recommendations	Does not include both results and recommendations	Includes completed achievements and at least 1 recommendation	Includes completed achievements and multiple recommendations
Overall comments:				

Name of Team GIVING Presentation:

Name of Team LISTENING to Presentation:

2019 JROTC STEM Leadership Academy Activity Calendar

Sunday, 2 June 2019	Monday, 3 June 2019	Tuesday, 4 June 2019	Wednesday, 5 June 2019	Thursday, 6 June 2019	Friday, 7 June 2019
Morning 8:00 am – Check-in/Registration Set up dorm rooms 9:15 am- Opening Assembly- 9:30 am Platoon Formation 10:15 am Pick Up Snack 10:30 am STEM Team Building	**Morning** 5:30 am – Wakeup 6:00 am – PT Training 7:00 am–Breakfast-SHC Pick up snack **R, Y, G Platoons Buses 1 & 2** 7:30 am-**Bus 1** load/depart **7:45 am Bus 2** load/depart 8:30 am **Bus 1** arrive BASF **Bus 2** Arrive SSAB 10:00 am **Load/depart Buses 1& 2**, Flip sites 10:30 am **Bus 1** arrive SSAB **Bus 2** arrive BASF 12:00 pm Load **Buses 1 & 2** Depart for SHC. 12:45 pm Lunch at SHC **B, O, P Platoons Buses 3&4** 8:00 am STEM Challenge 1 Investigations 2-4 11:45am Lunch at SHC 12:15 pm- **Bus 3** load/depart 12:30 pm **Bus 4 load/**depart	**Morning** 5:30 am – Wakeup **R, Y, G Platoons Buses 1&2** 6:15 am–Pick up Breakfast Bags, Load **Buses 1&2** 6:30 am **Bus 1** Depart for Hyundai **Bus 2** depart for Dannelly Field- 9:30-11:00 am Site visits 11:00 am **Bus 2** Lunch w/Air Nat'l Guard **Bus 1 Travel** to Dannelly Field. 11:30 am **Bus 1** Lunch w/Air Nat'l Guard **Bus 2** Travel to Hyundai 12:00 pm Tours at both facilities 1:45 pm **Buses 1 & 2** depart for SHC **B, O, P Platoons Buses 3&4** 6:30 am Breakfast-SHC 7:00 am Mon Field Trip After Action Review 7:10 am STEM Challenge2 Investigation 1 -Begin Investigation 2 11:15 am Pick up Sack Lunch & Load **Buses 3&**4 11:30 am **Bus 3 & 4** Depart- **Bus 3** for Hyundai **Bus 4** for Dannelly Field Lunch on Bus	**Morning** 6:00 a.m. – Wakeup 7:00 am–Breakfast-SHC Pick up snack as leave **R, Y, G Platoons Buses 1&2** 7:30 am – Load/Depart Buses 8:00 am Arrive at USA Shelby Hall COE Sessions (Inc. Tu After Action Review) 11:10 am Campus Tour 12:10pm Leave for SHC 12:30 pm Arrive/Lunch (SHC) **B, O, P Platoons Buses 3&4** 7:30 am STEM Challenge 2 Finish Investigation 2 & Design & Test 10:00 am Break 10:15 am STEM Challenge 2 L3 11:45 am Lunch (SHC) 12:30 pm **Buses** Load/Depart USA	**Morning** 6:00 a.m. – Wakeup 7:00 am–Breakfast-SHC 7:30 am Load Buses **R,Y,G Platoons Buses 1& 2** 7:45 am: Depart for Blakely 8:15 am: Land Navigation 9:45 am Load buses to flip sites 10;00 am: Depart Site 10:30 am**:** Rappelling **B, O,P Platoons Buses 3&4** Depart for Rappelling Site 8:15 am: Rappelling 9:45 am Load buses to flip sites 10:00 am: Depart Site 10:30 am :Land Navigation	**Morning** 6:00 am.– Wakeup & Pack 7:00 am–Breakfast-SHC 8:00 am – Photos MAJ Holt 8:30 am –Prepare & practice Presentations and On-Line Post Assessment 11:30 am STEM Poster Sessions
Afternoon 12:30 pm – Lunch at SHC 1:15 pm Pre-Assessment Part II 1:30 pm Finish Teambuilding 3:00 pm break 3:15 pm Launch STEM on the Ground: STEM Challenge 1, Inv. 1 6:00 pm Journal Reflections Teamwork Consensus	**Afternoon** **R, Y, G Platoons Buses 1 & 2** 1:15 pm Field Trip After Action Review 1:25pm STEM Challenge 1 Investigations 2-4 **B, O, P Platoons Buses 3&4** 1:00 pm- **Bus 3** arrive BASF **Bus 4** arrive SSAB 2:30 pm- **Load buses 3 and 4** Flip sites 3:00 pm- **Bus 3** arrive SSAB **Bus 4** arrive BASF 4:30 pm-Load **Buses 3 and 4** Depart for SHC 5:00 pm-**Bus 3&4** arrive SHC 5:10 pm **ALL** Journal Reflections	**Afternoon & Early Evening** **R, Y, G Platoons Buses 1& 2** 4:15 pm Arrive SHC 4:30 pm STEM Challenge 2 Lessons 1 6:30 pm Dinner (SHC) 7:00 pm STEM Challenge 2 Investigation 1 Begin Investigation 2 **B, O, P Platoons Buses 3&4** 2:15 pm **Bus 3** arrive Hyundai. **Bus 4** arrive Dannelly Field 2:30 pm Tours at both facilities 4:00 pm **Bus 4** dinner w/ Air Nat'l Guard **Bus 3** depart for Dannelly 4:30 pm **Bus 3** dinner at Dannelly 4:45 pm **Bus 4** depart for Hyundai 5:15 pm Tours at both facilities 7:00 pm **Buses 3& 4** depart for SHC	**Afternoon** **R, Y, G Platoons- Buses 1 & 2** 1:15 pm STEM Challenge 2 Finish Investigation 2 3:30 pm Break 3:45 pm STEM Challenge 2 Design and Test **B, O, P Platoons Buses 3 & 4** 1:00 pm-USA Campus Tour 2:00 pm USA COE Shelby Hall (Inc. Tu After Action Review) 5:10 pm Buses depart for SHC 5:30 pm Arrive at SHC **ALL** 5:30 pm Teamwork Check-In 6:00 pm Journal Reflections	**Afternoon** 12:15 pm **ALL Buses** Load/Depart 12:45 pm Arrive at SHC 12:45- Lunch at SHC Provided by Army Nat'l Guard 1:15 pm Cadre Collect Uniforms & Helmets 2:00 pm After Action Review or STEM Challenge 2:30 pm Final STEM Challenge	**Afternoon** 12:15 pm – 2:00 pm Lunch & Awards Ceremony Guest Speaker Mrs. Liz Parry, Engineer, Consultant & Past Chair, K-12 Division, American Society of Engineering Educators 2:00 pm Academy Closeout 4:00 pm Dismiss staff
Evening 6:30 pm Dinner/Guest Speakers MAJ Steve Barrier, 3rd Infantry Aviation Officer Mr. Glen Johnson US Army Cadet Command's 1st Brigade 8:00 pm Movie Night Optional Church Service 9:030pm Personal Time Snack in Mailroom 10:00 Lights Out	**Evening** 5:30pm Dinner/Guest Speaker Dr. Andy Kent-USA Dean COE 6:30 pm Load/Depart Buses 7:00 pm Drown proofing (ATC) 9:00 pm Load/Depart for SHC 9:30 pm Return to SHC, Snack in Mailroom 10:00 pm Lights Out	**Late Evening** 9:00 pm **RYG Platoons** Personal Time 9:30 pm **BOP Buses 3 & 4** Arrive at SH 9:30 pm Personal Time Snack in Mailroom 10:00 Lights Out	**Evening** 6:30 pm Dinner & Guest Speaker LTC. Chris Chapman USARMY 101 ABN DIV 7:30 pm Sports Night 9:30 pm Personal Time Snack in Mailroom 10:00 Lights Out	**Evening** 5:30 pm Dinner & Guest Speaker COL Michael A. Stinnett, Army JROTC Director 6:30 pm Final STEM Challenge 8:00 pm Introduce Presentations 8:30 pm Journal Reflections 9:00 pm Personal Time/pack Snack in Mailroom 10:00 pm Lights Out	**Evening**