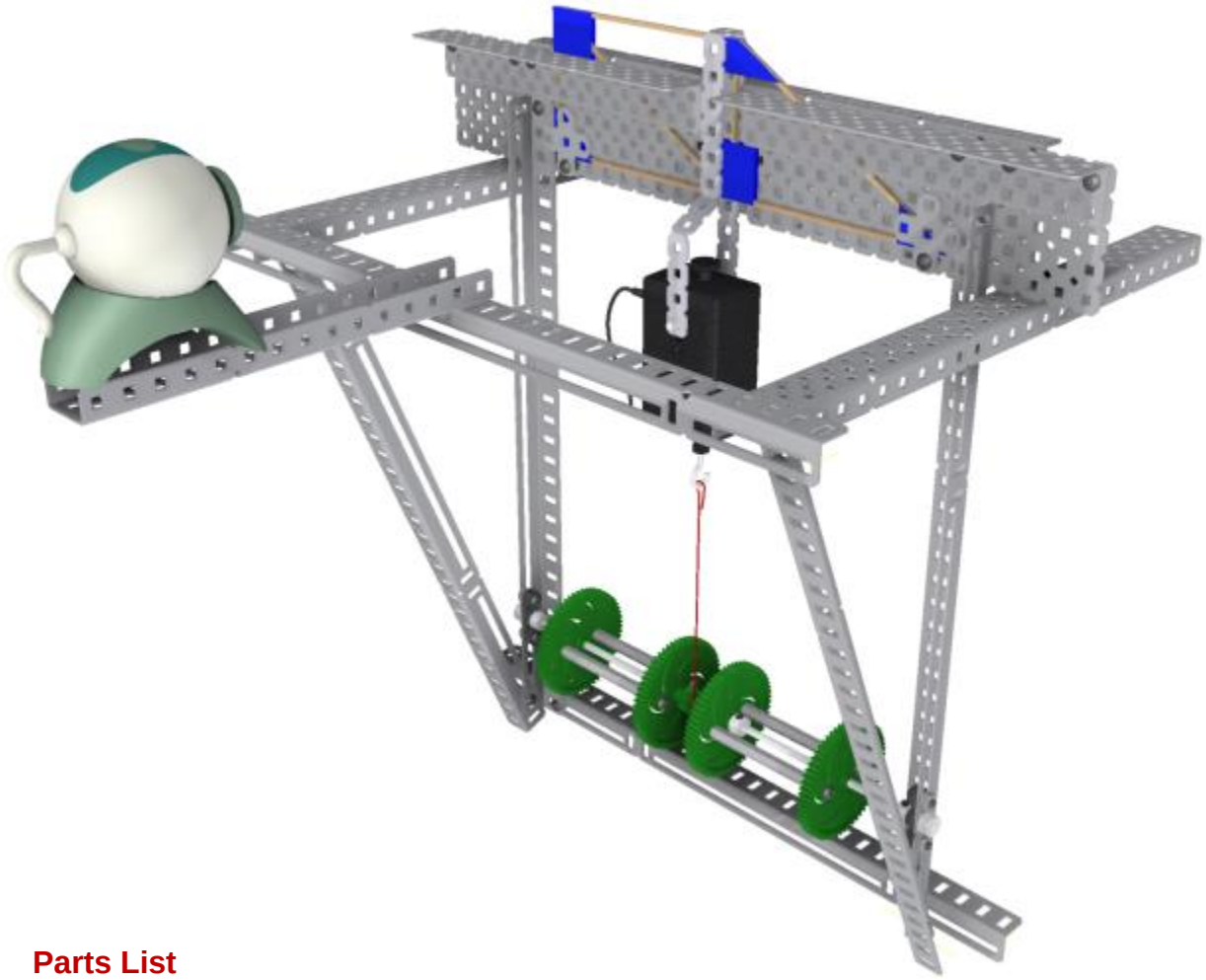
PLTW | Engineering

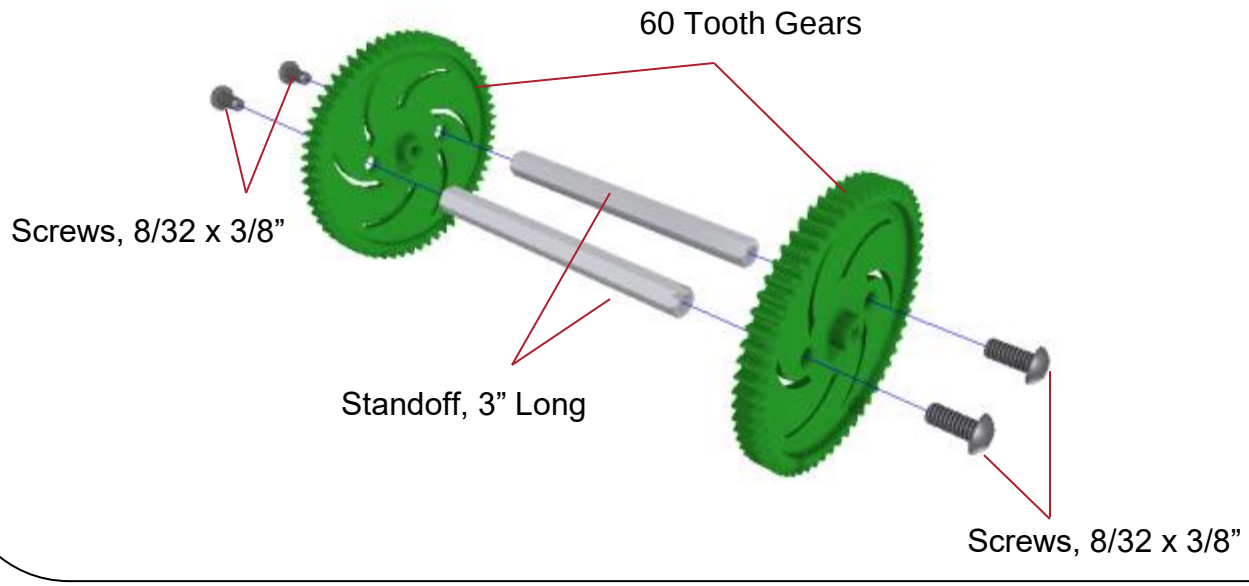
# Truss Tester Assembly and Procedure



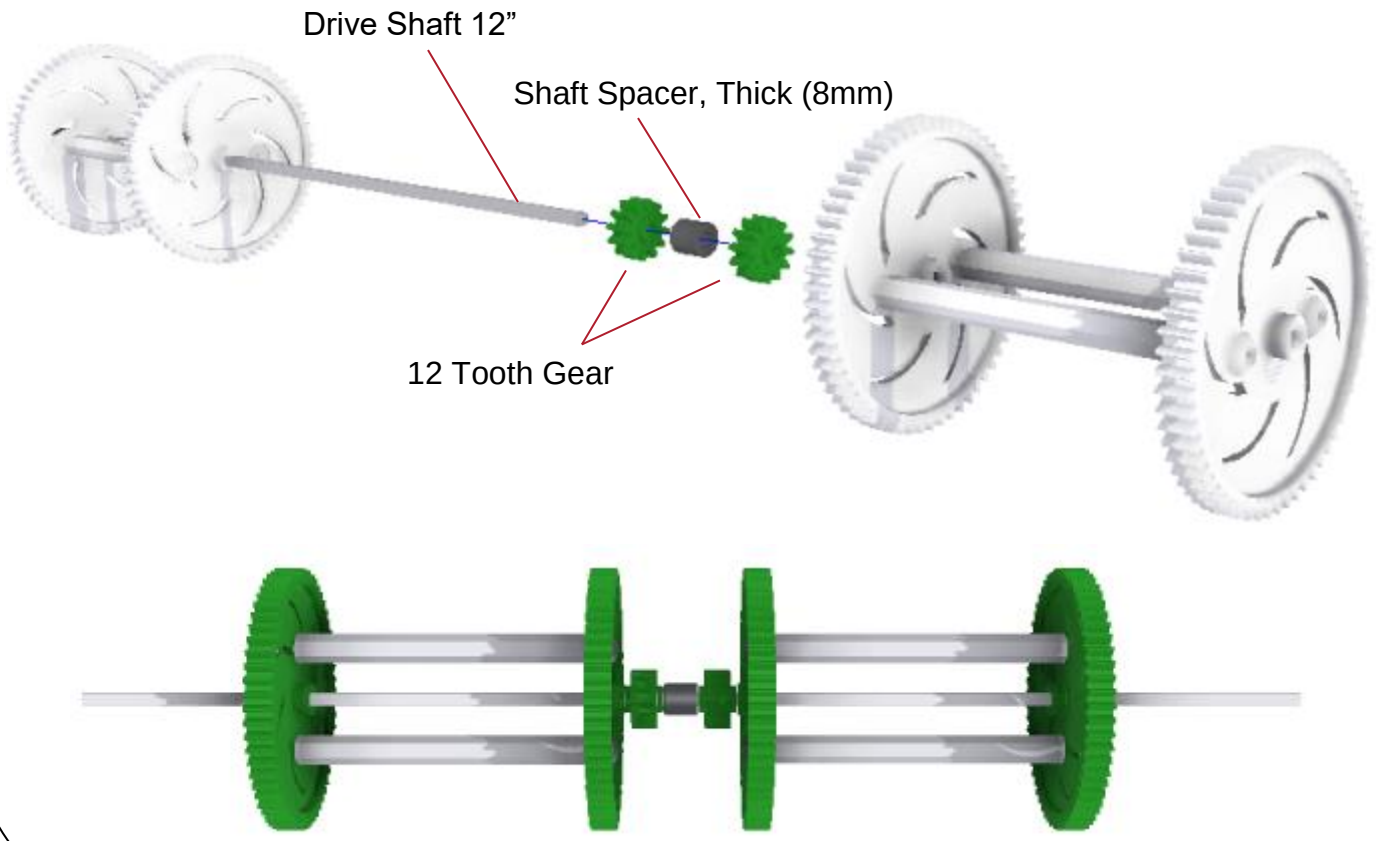
## Parts List

| MATERIALS | QUANTITY | MATERIALS | QUANTITY |
|---|---|---|---|
| Screws 8/32 x ¼” | 10 | Drive Shaft 12" | 1 |
| Screws 8/32 x 3/8” | 10 | Drive Shaft 2" | 1 |
| Screws 8/32 x ½” | 6 | Shaft Collar | 8 |
| Screws 8/32 x ¾” | 6 | Slotted Angle, 30 Holes Inverted | 1 |
| Screws 8/32 x 1” | 6 | Slotted Angle, 30 Holes | 5 |
| Nuts, Keps | 30 | Chassis Bumper 2x2x15 Holes | 2 |
| Standoffs, 3” Long | 4 | Plus Gusset | 2 |
| Bearing Flat | 2 | Plate 5x15 Holes | 2 |
| 60 Tooth Gear | 4 | C-Channel, 1x5x1x25 Holes | 1 |
| 12 Tooth Gear | 2 | C-Channel, 1x5x1x25 Holes | 2 |
| Shaft Spacer, Thin | 8 | C-Channel, 1x5x1x15 Holes | 1 |
| Shaft Spacer, Thick | 13 | Bar 1x25 Holes | 1 |

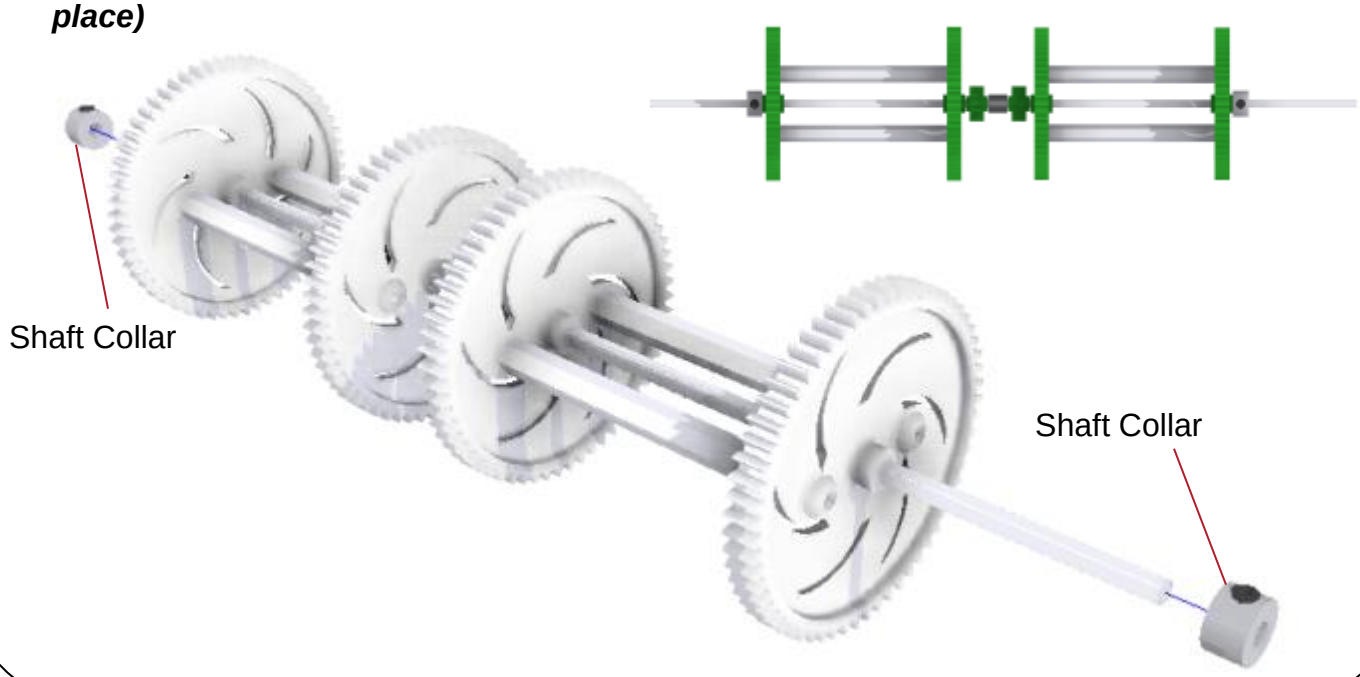
**Step 1 – Force Handle Part 1** ***(Create two of the following assemblies)***



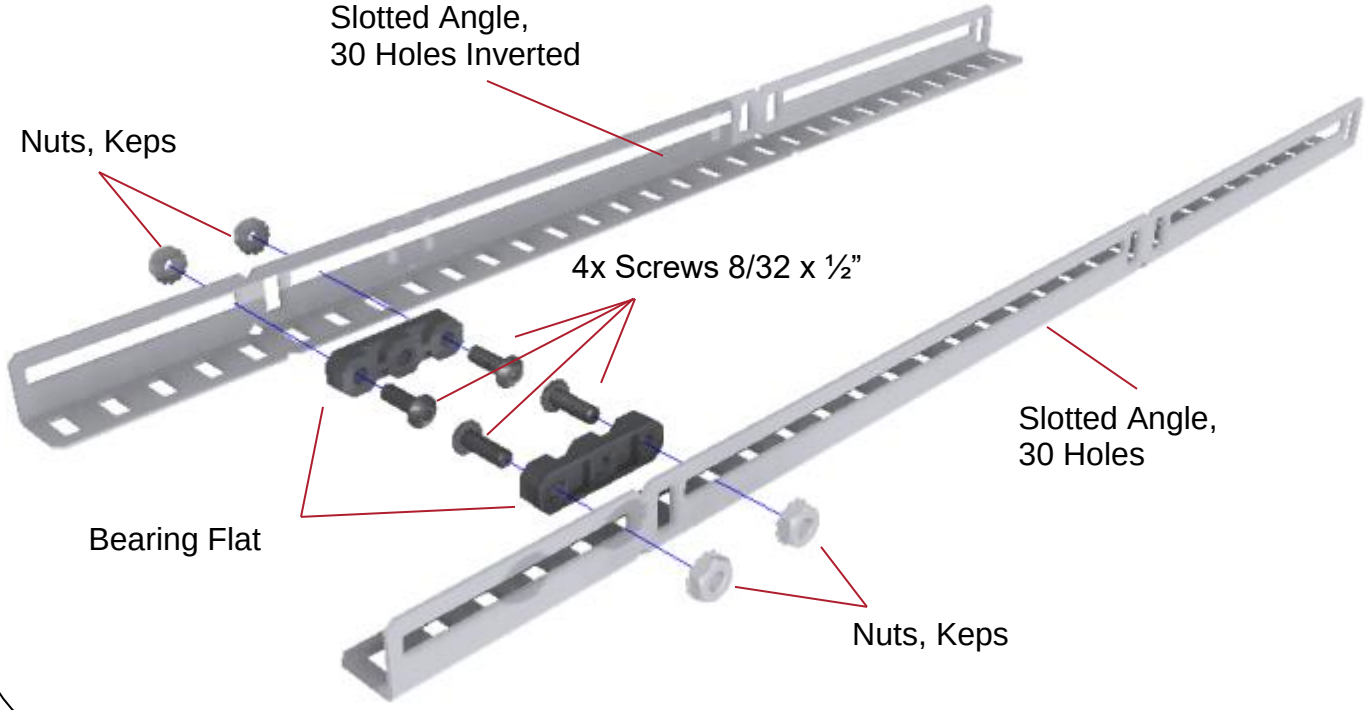

**Step 2 – Force Handle Part 2** ***(Center all parts on the 12” Drive Shaft)***



**Step 3 – Force Handle Part 3** ***(Slide collars up against gears to hold handle in place)***

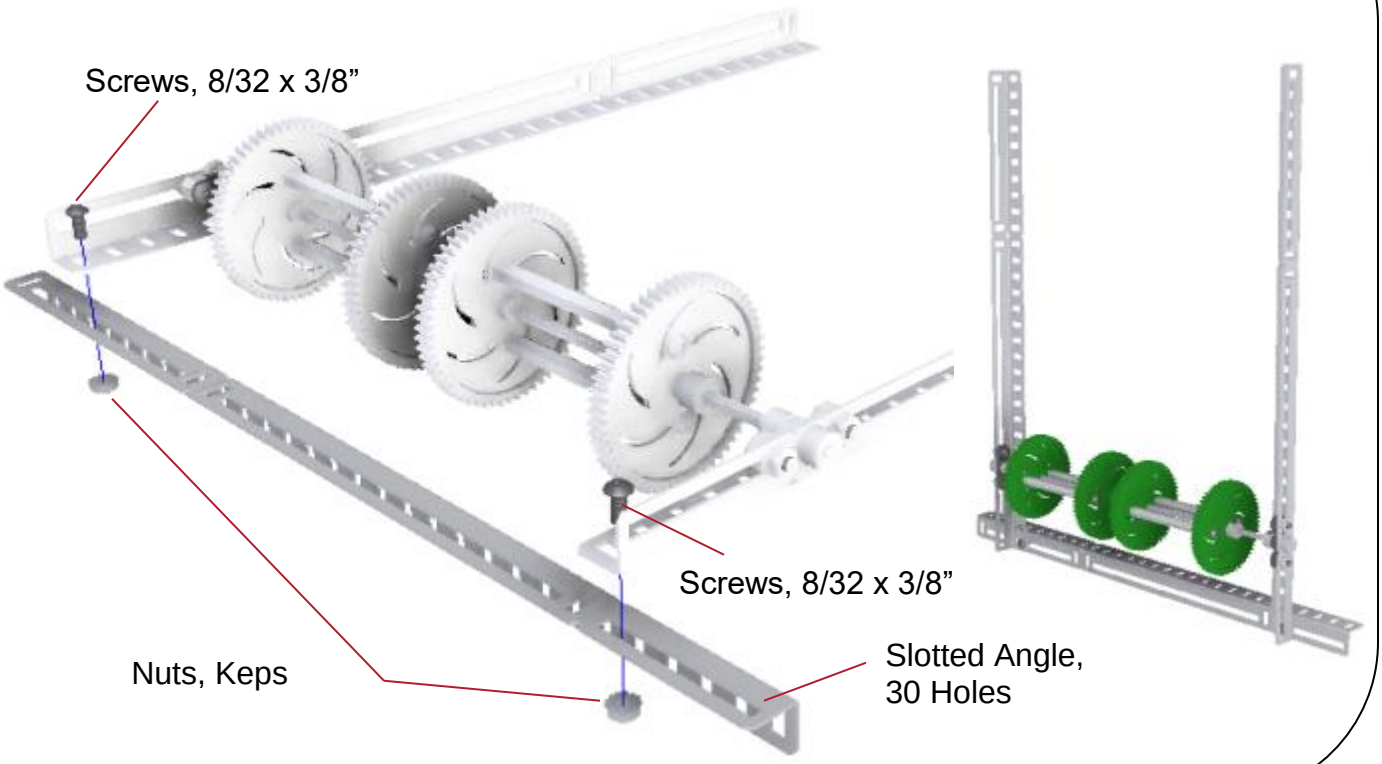



**Step 4 – Force Handle Vertical Supports**



**Step 5 – Force Handle and Vertical Supports**

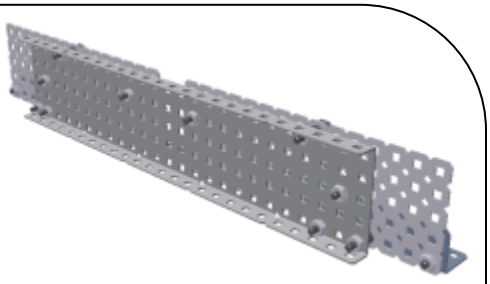

**Step 6 – Force Handle and Vertical Supports with Bottom Brace**

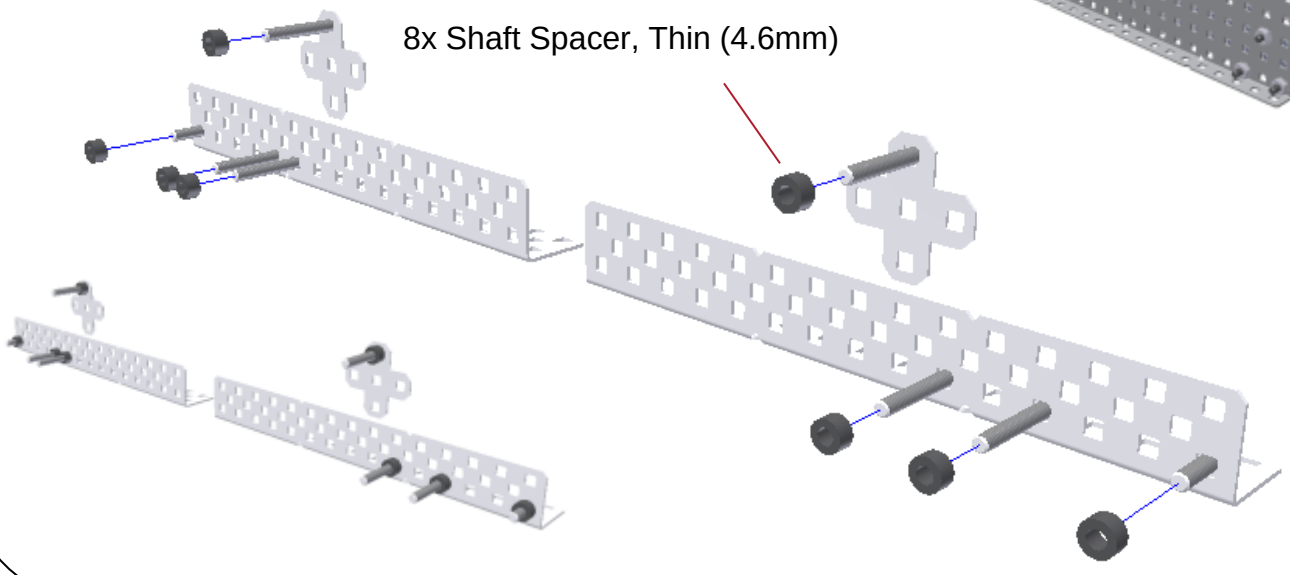


## Step 7 – Truss Support – Front Frame

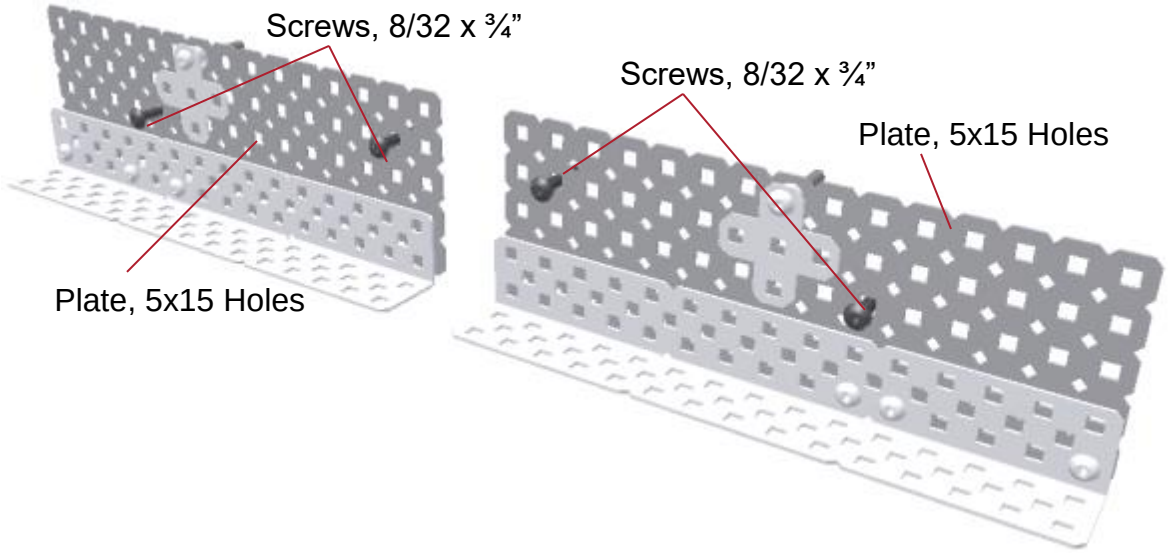



## Step 8 – Truss Support – Front Frame - Continued

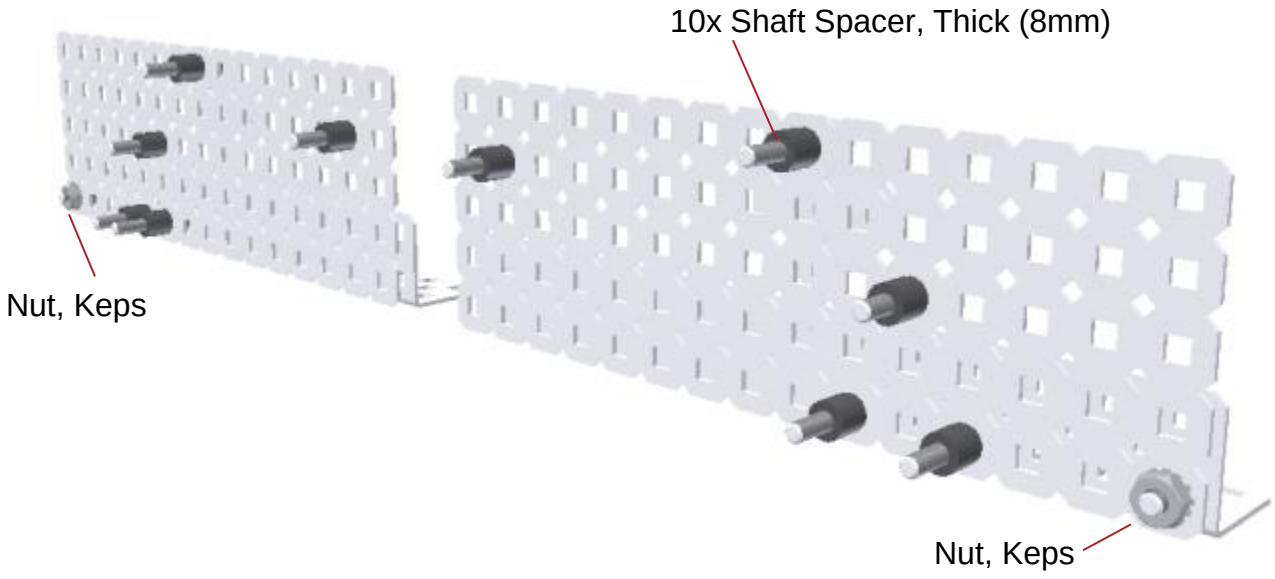




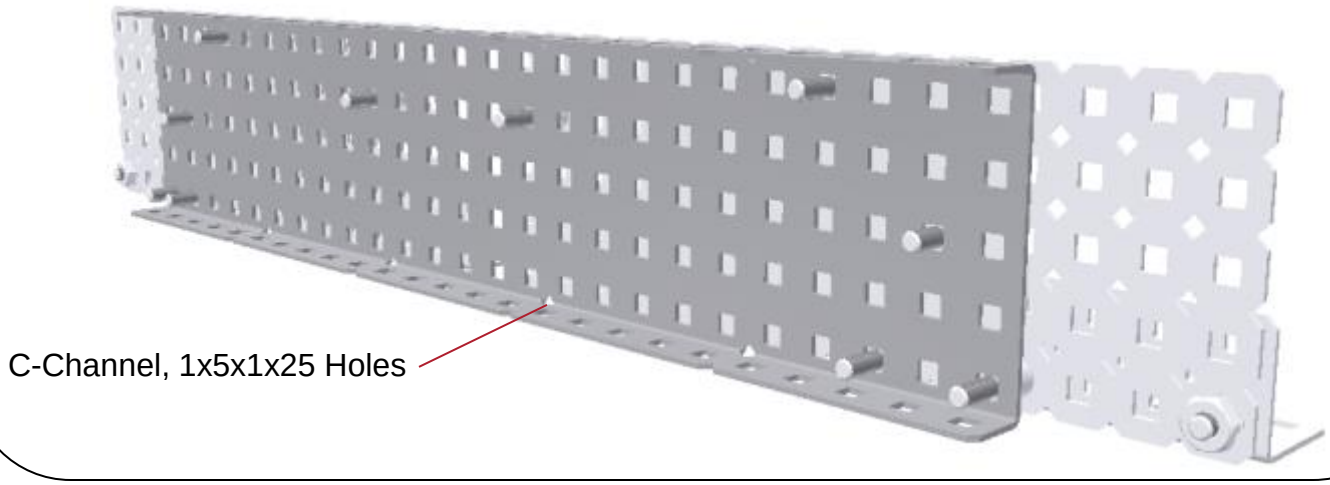
**Step 9 – Truss Support – Center Frame**



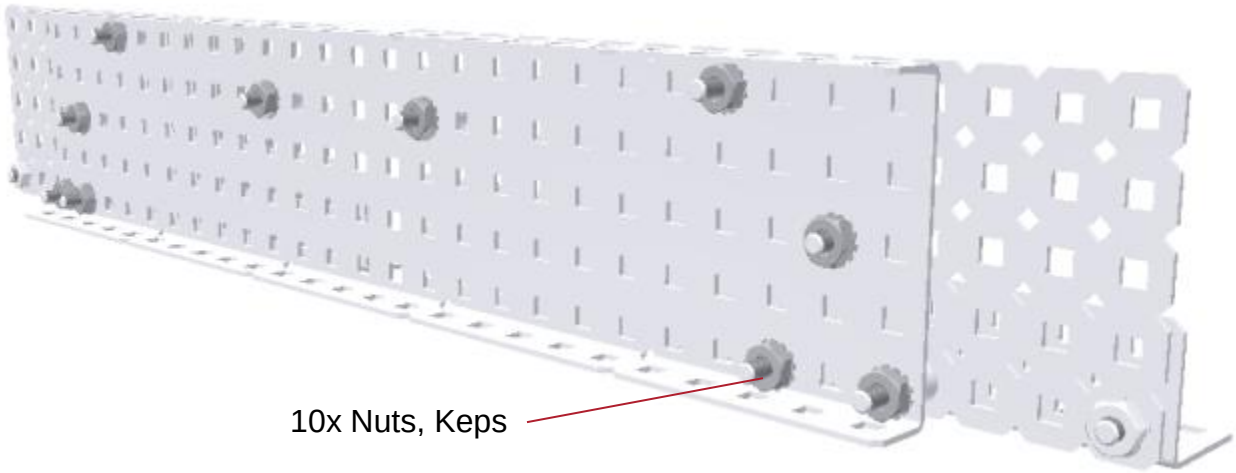

**Step 10 – Truss Support – Center Frame - Continued**



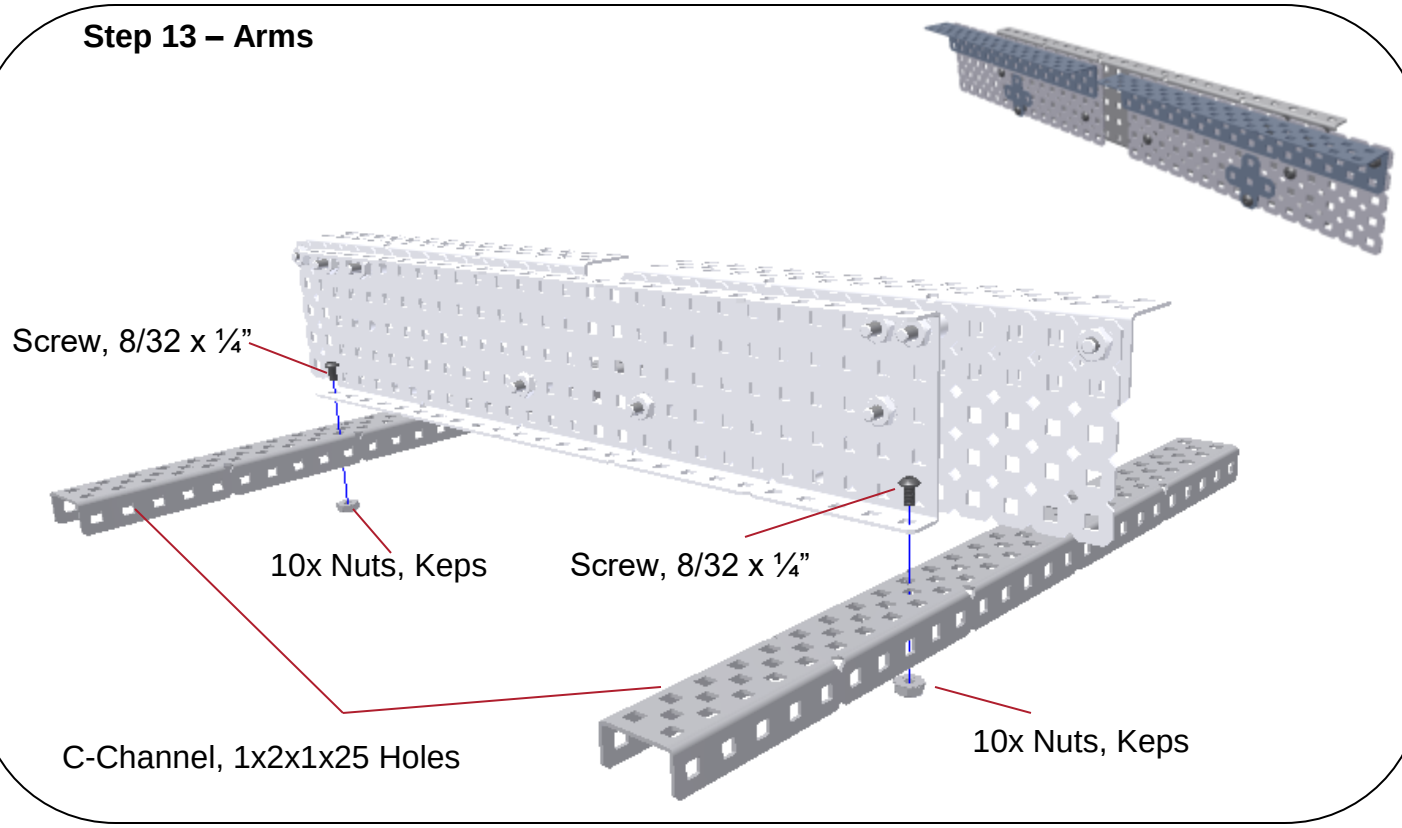
**Step 11 – Truss Support – Back Frame**



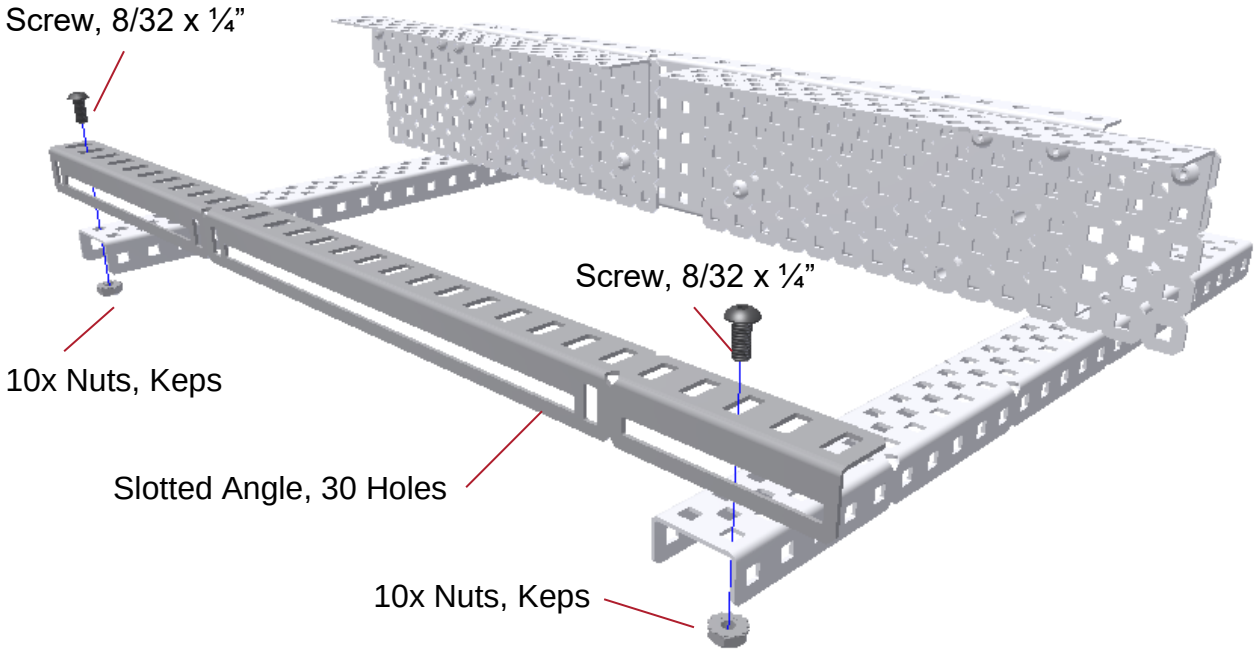

**Step 12 – Truss Support – Back Frame - Continued**



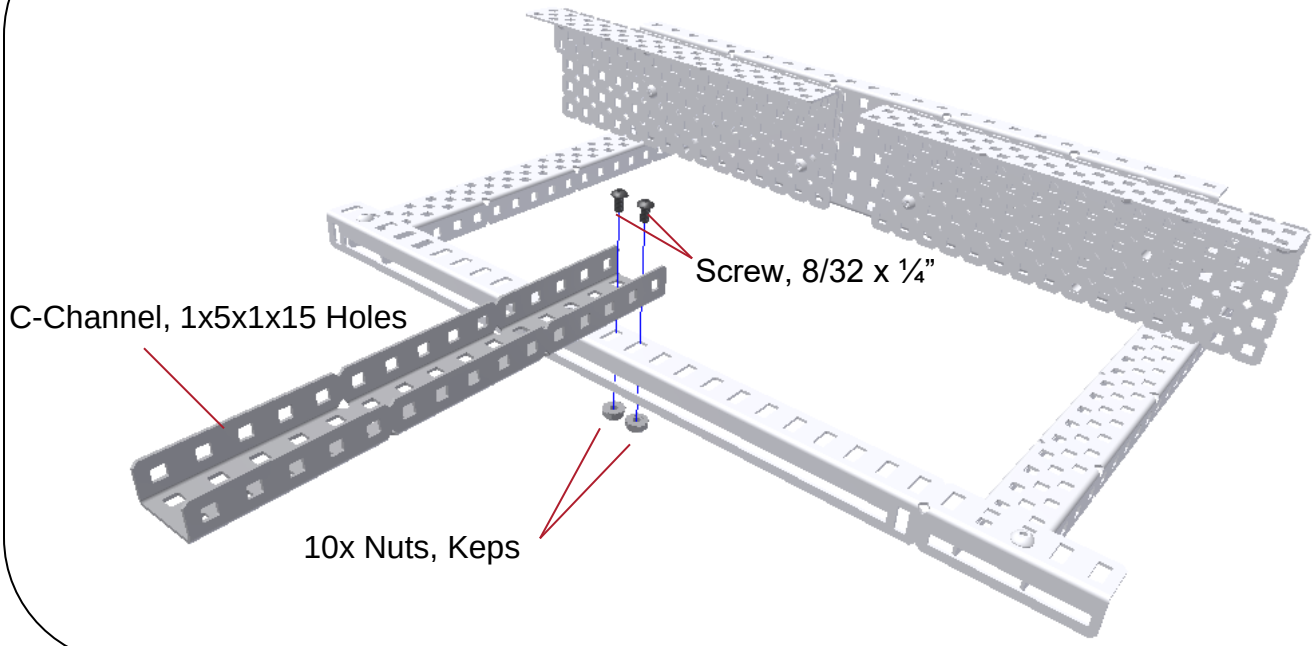
## Step 13 – Arms



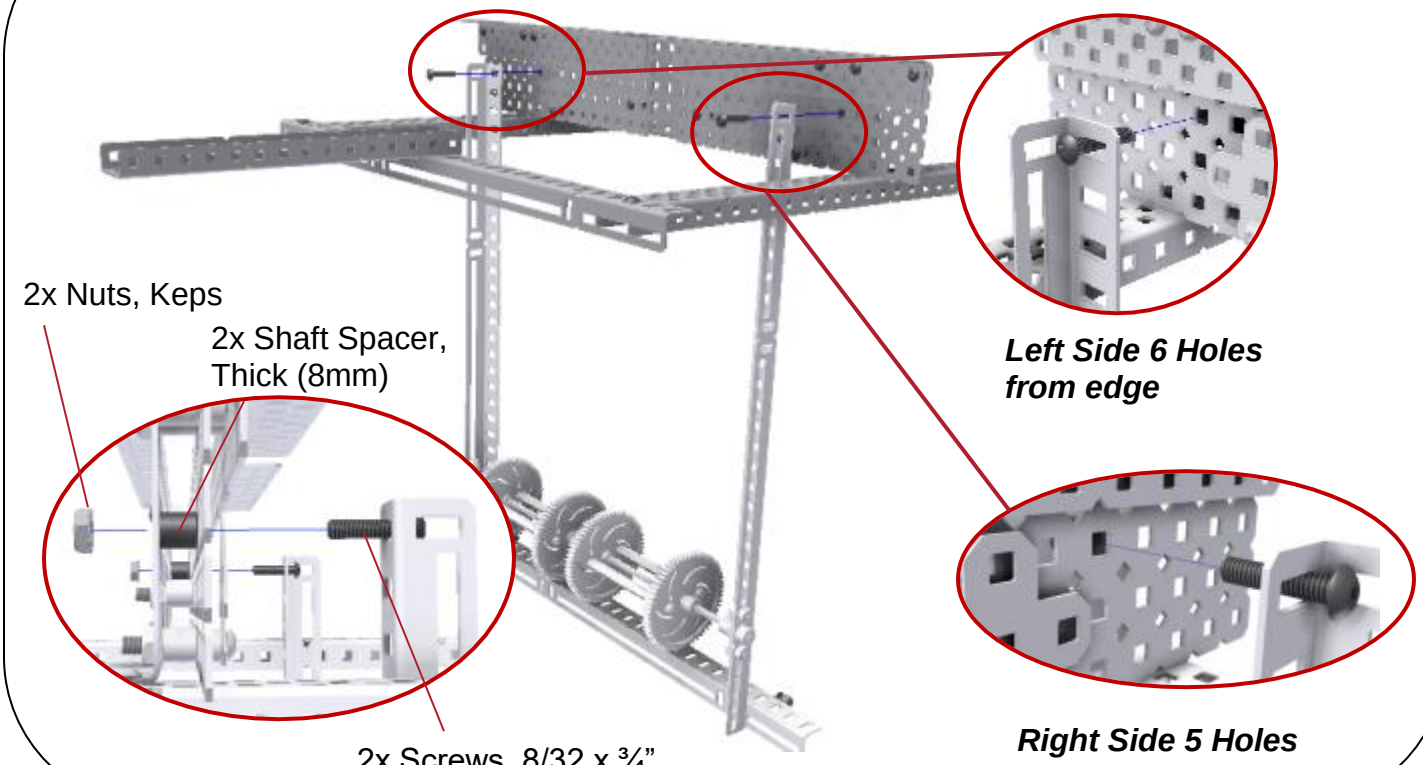

## Step 14 – Web Cam Support



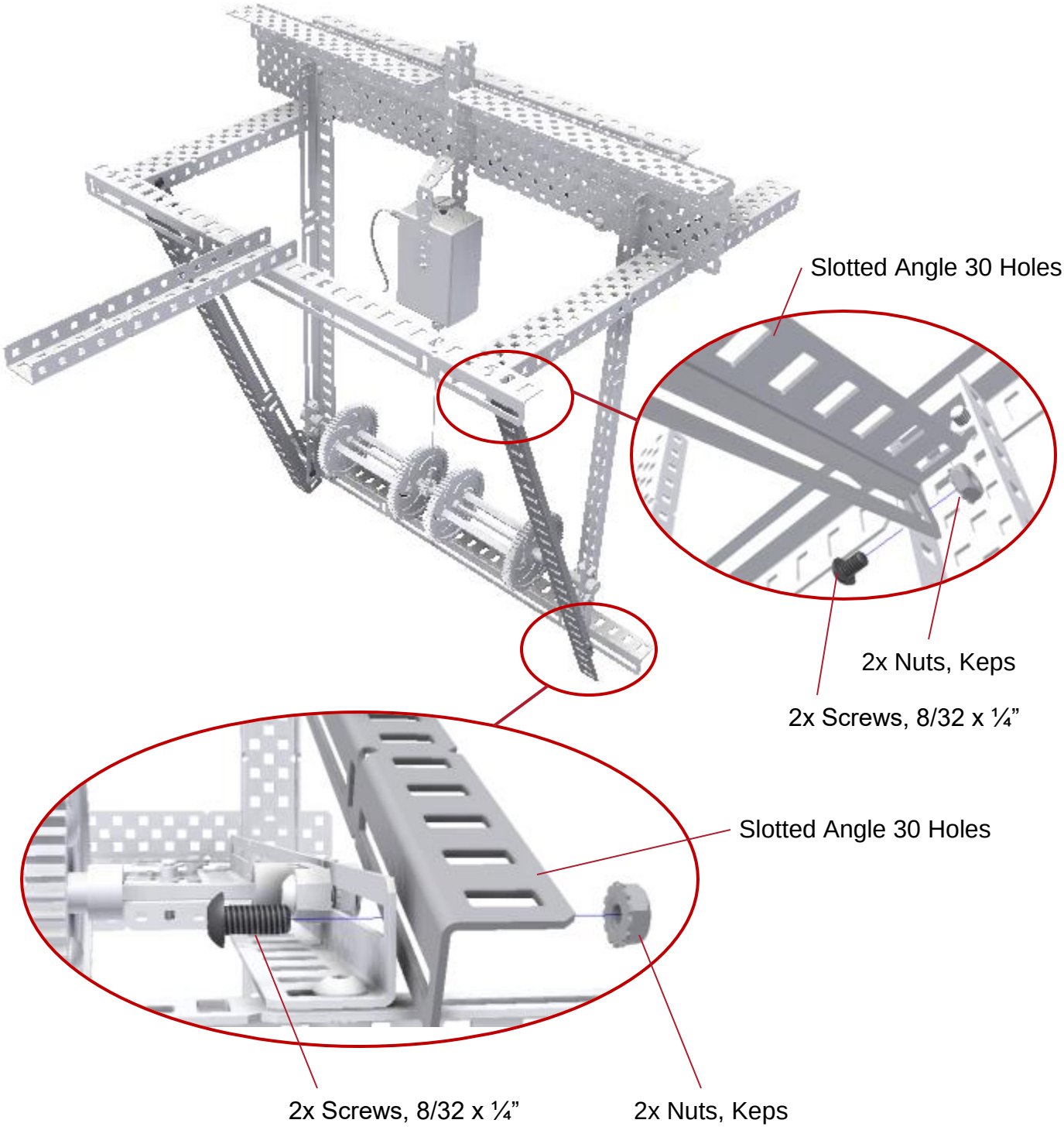
## Step 15 – Web Cam Support - Continued



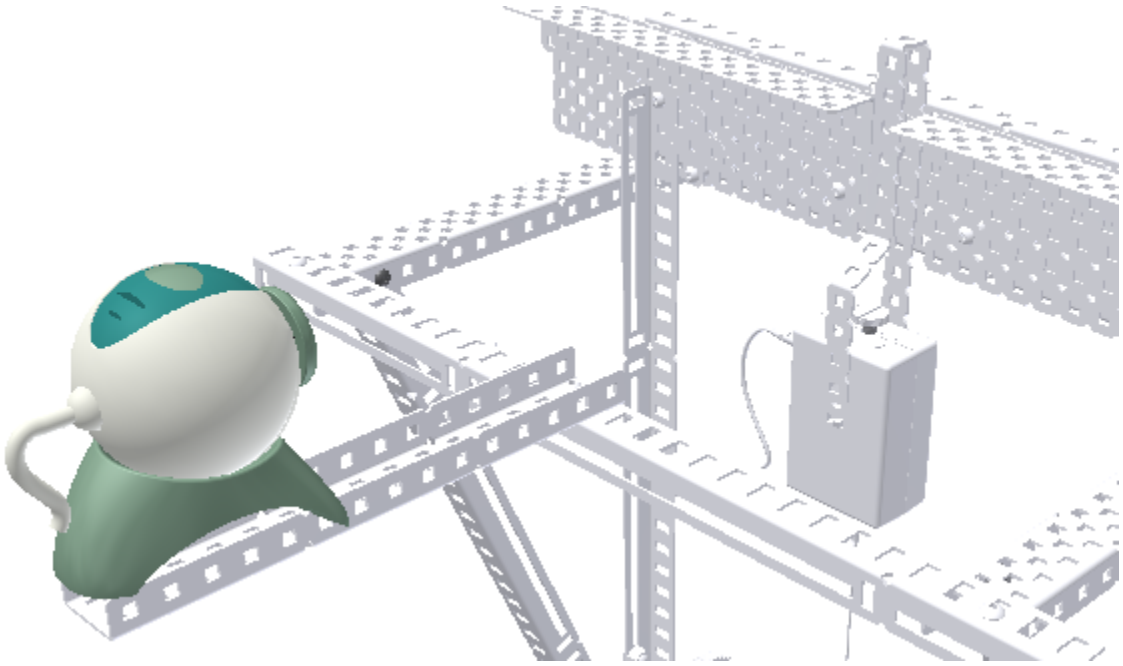

## Step 16 – Force Handle and Truss Support Assembly



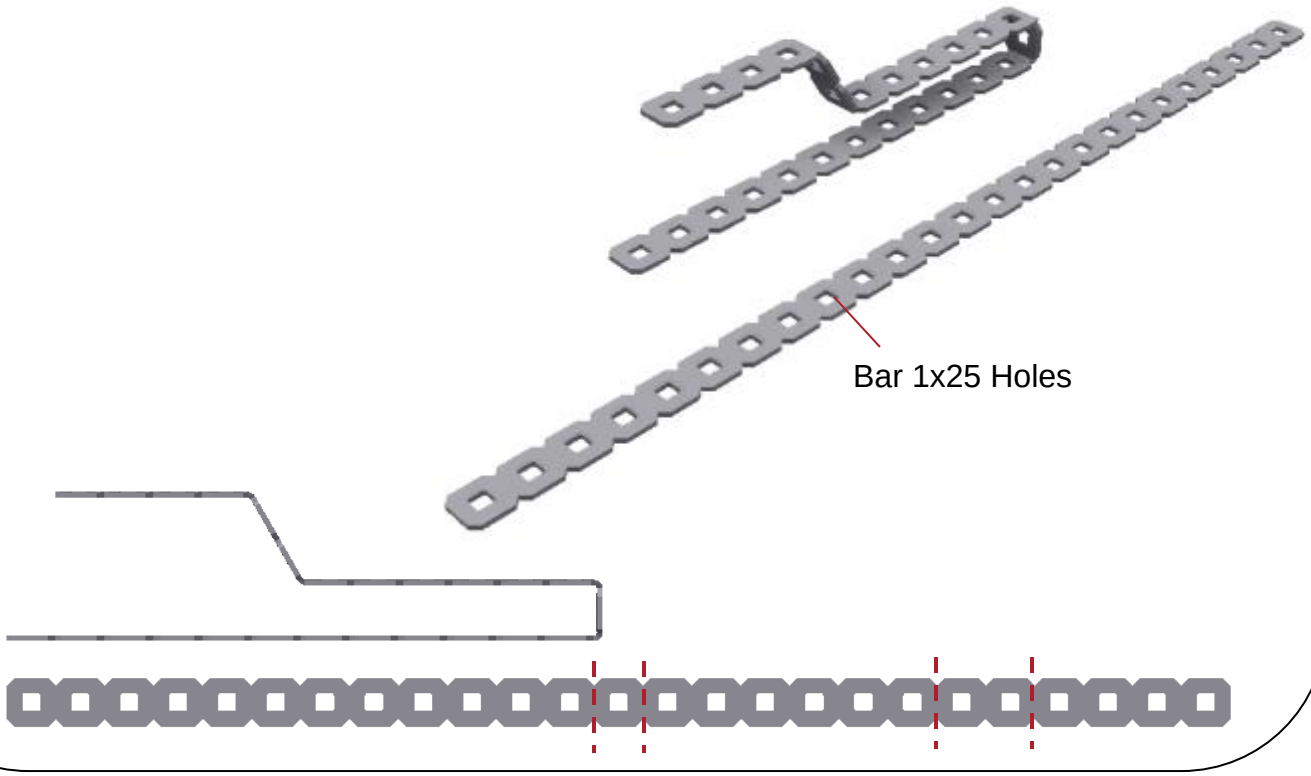
**Step 17 – Front Brace Supports**



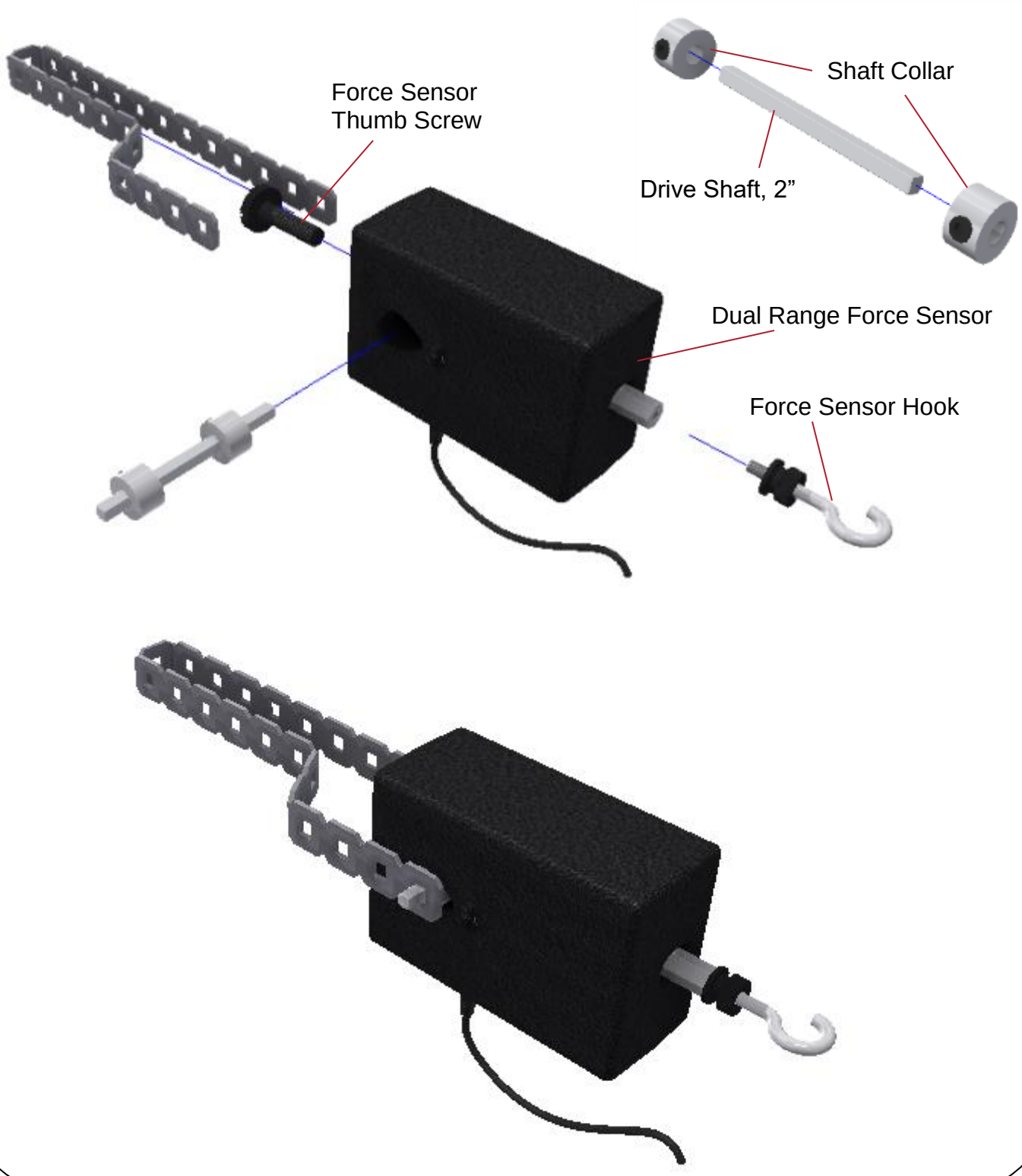
**Step 18 – Mount Web Cam *(use zip ties to secure camera)***



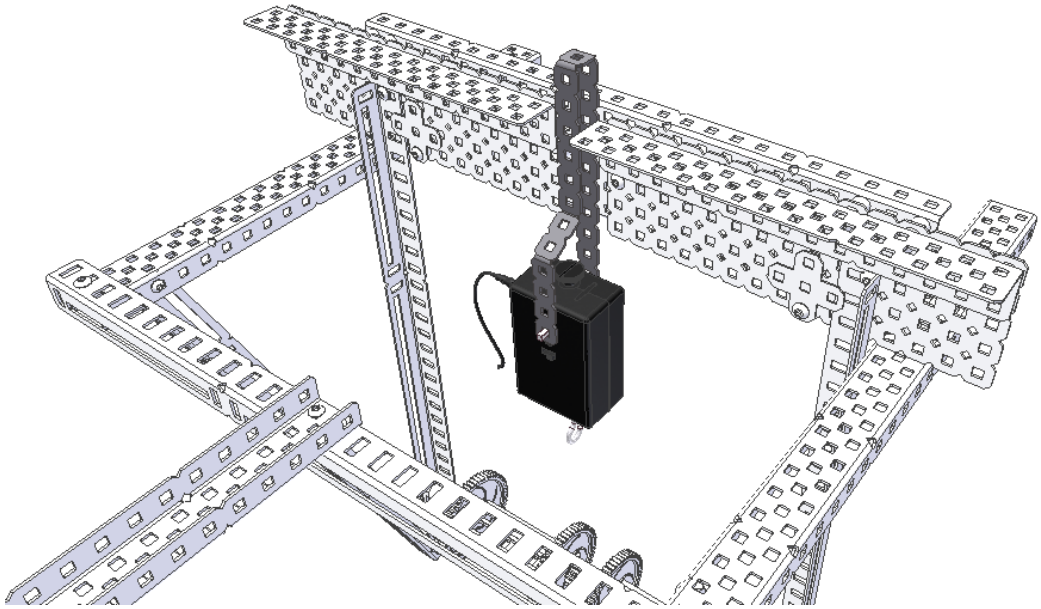
**Step 19 – Tester Setup - Force Arm**

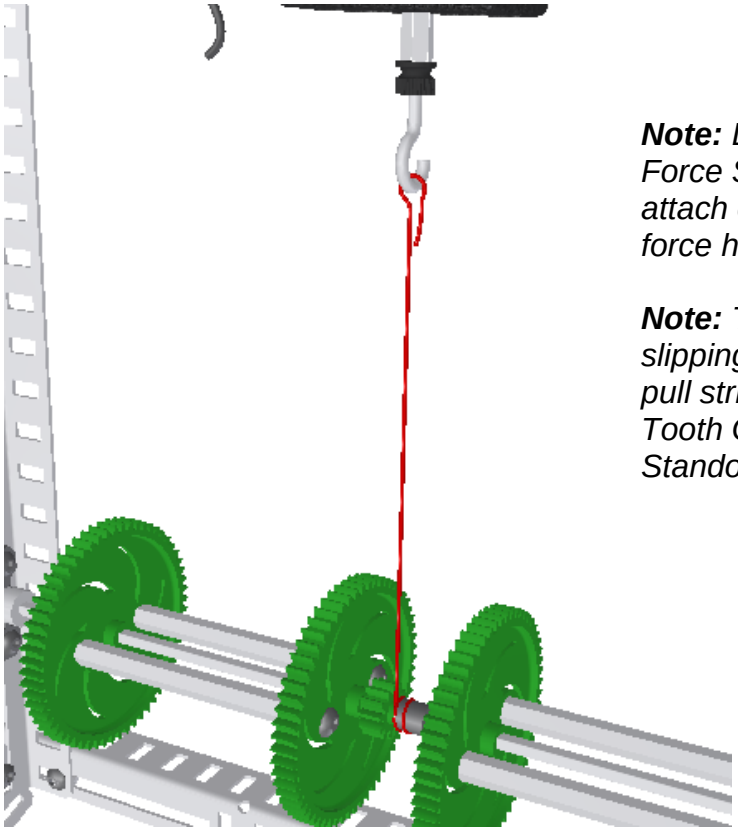


**Step 19 – Tester Setup and Assembly**



**Step 20 – Tester Setup and Assembly - Continued**

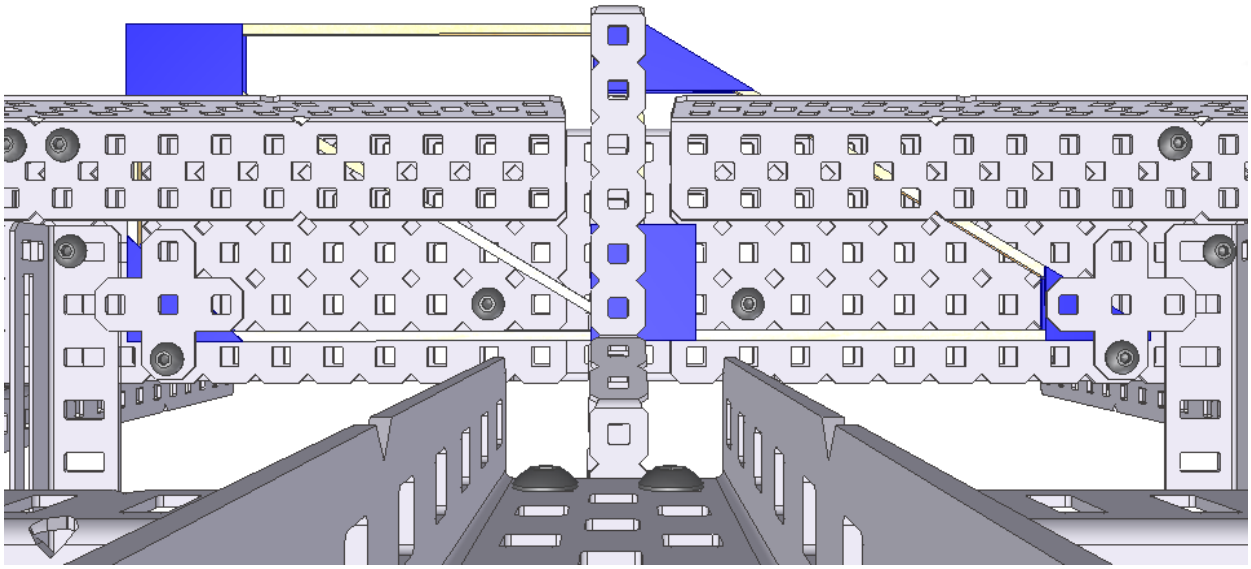


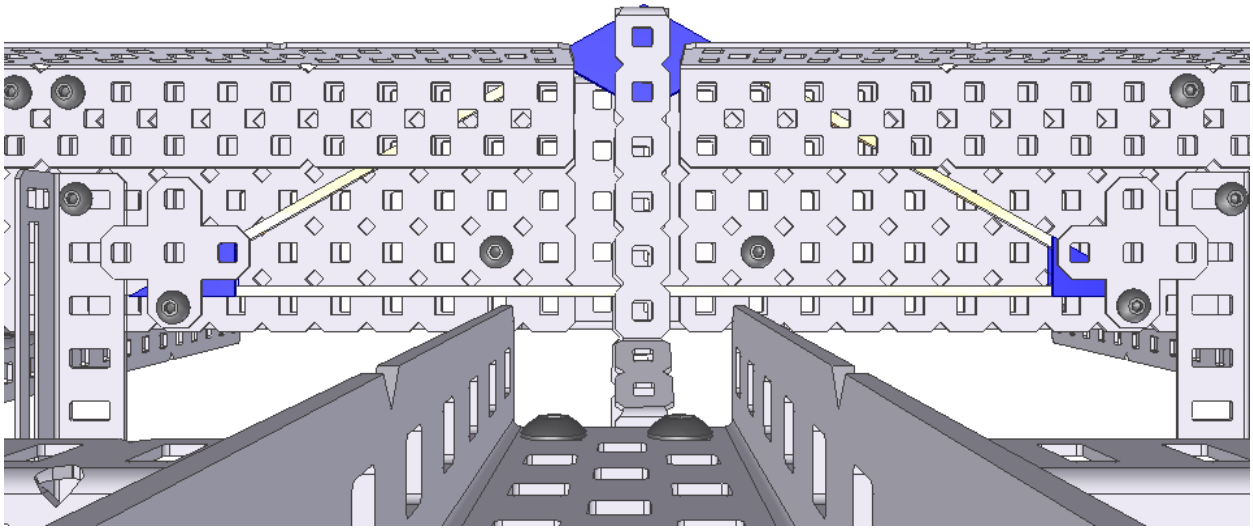


***Note:*** *Loop string around Force Sensor Hook and attach opposite end to force handle.*

***Note:*** *To keep string from slipping around handle, pull string through the 60 Tooth Gear and attach to Standoffs*

## Step 21 –Inserting a Truss





## Procedure

This procedure will demonstrate how to use the force sensor, webcam and LoggerPro to test your truss design.

1. Change the Dual-Force Sensor to the +/- 50N setting. Attach the sensor to the part that fits over the truss.
2. Tie a loop in a string to attach to the hook. Cut the string about 6 in. longer then the distance between the hook and the shaft it will be attached to.
3. Push the string through a hole in the larger gear and tie a knot in the end of the string larger than the hole. Pull the string through until the knot is against the hole.
4. Wind the shaft to pull the excess slack out of the line. and

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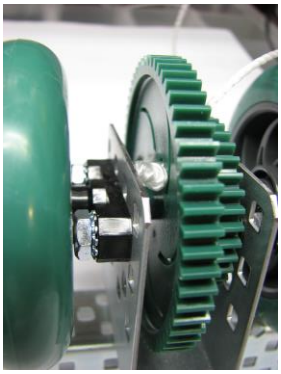
<td>  </td>
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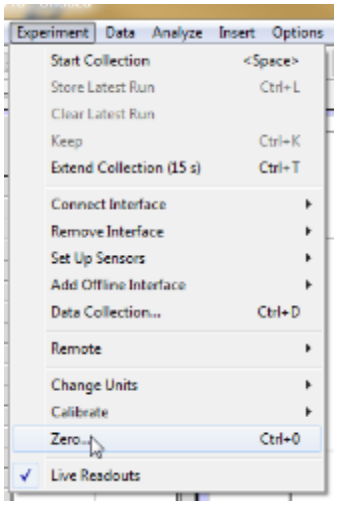
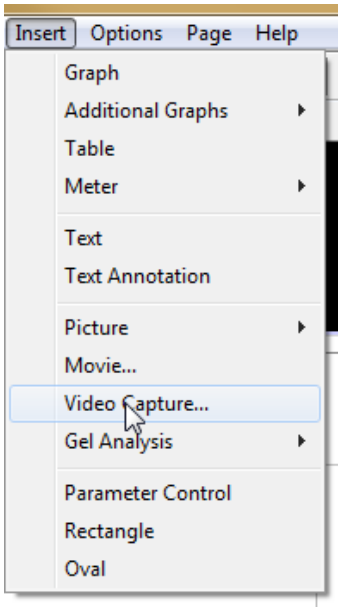
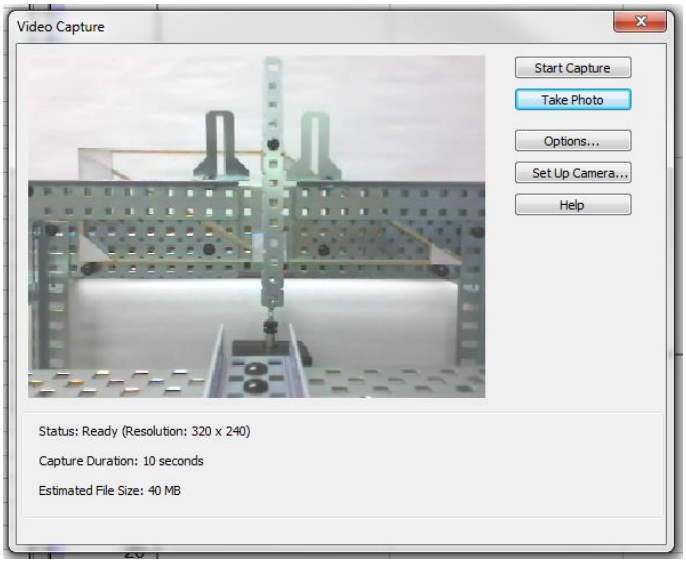
5. Connect the webcam and Golink! sensor to open USB ports.
6. Connect the Dual-Force Sensor to the GoLink! and open LoggerPro.
7. Hold the dual force sensor with the hook that connects to the brace unattached and Zero the sensor.



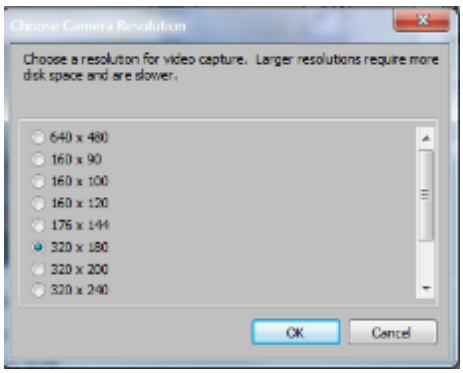

8. Choose Video Capture to set up the camera.

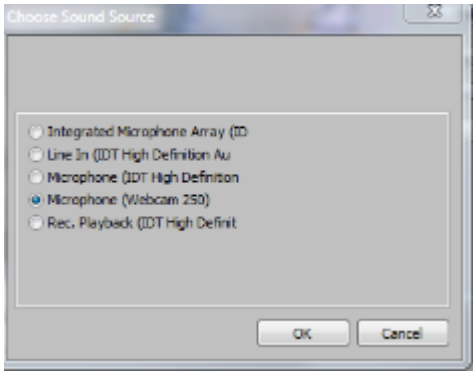



9. With the Webcam plugged in choose it on the next screen if there is more than one option, and the next screen should show the video from the Webcam. You may need to manually focus the Webcam.

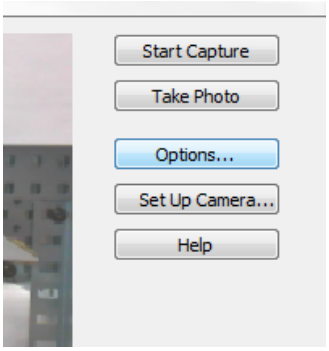



10. Choose Set Up Camera (just under Options). You may need to choose the camera again. Choose 320x180 and click OK. Choose the Webcam's microphone. Choose Click OK.

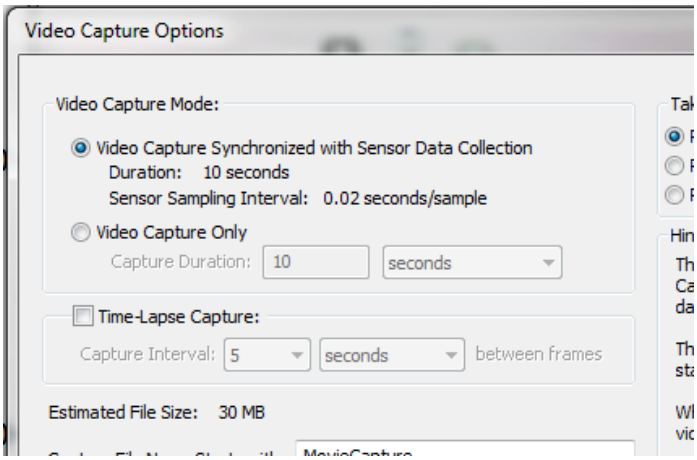


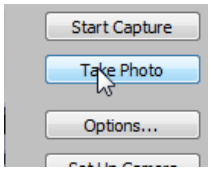

11. Click the Options tab.




12. Make sure you have Video Capture with Sensor Data Collection chosen.



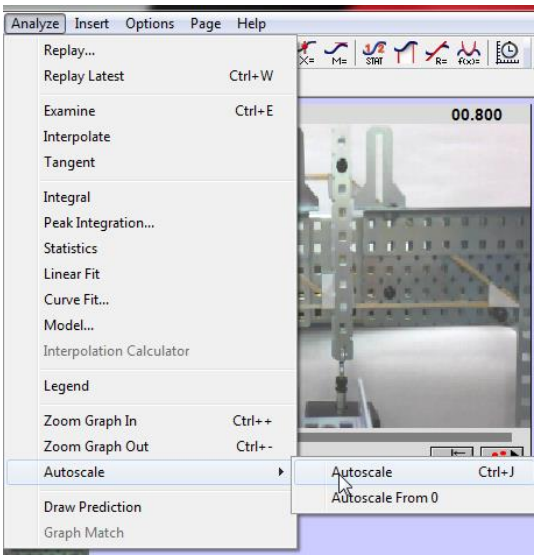

13. 13. Take a photo using the Take Photo function to capture an image of the truss before breaking it.

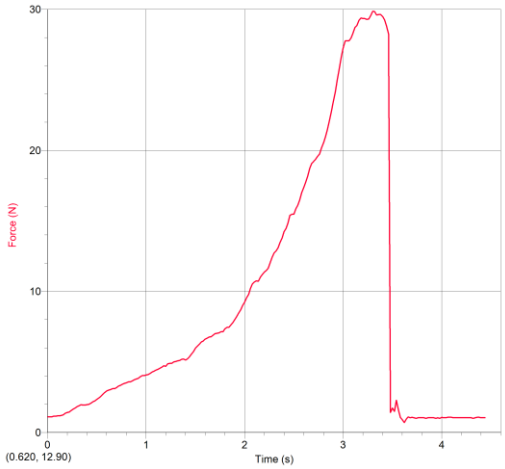



14. Your team is now ready to test the truss. Remember you have 10 seconds, which may or may not seem like a lot of time. One person should be responsible for steadily cranking the string tight. Another person should start and stop the video capture and relay the time in seconds to the person breaking the truss. If you want to try it once, break a piece of scrap balsa. Your test should only have one major break, i.e. if the top breaks the test is completed; do not continue to break other portions of the truss.

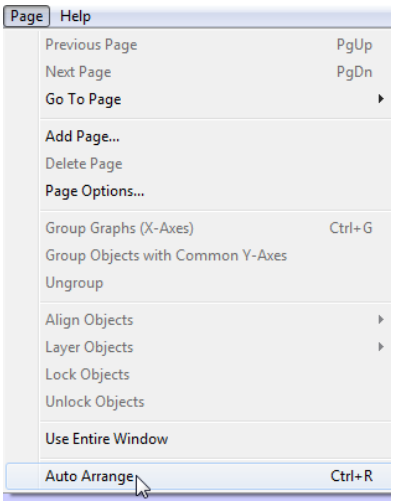
15. Take a photo of the failed truss. Your file should have the graph, video and before and after pictures as shown below. Be sure to save.

16. Use Autoscale graph to zoom in on the graph.

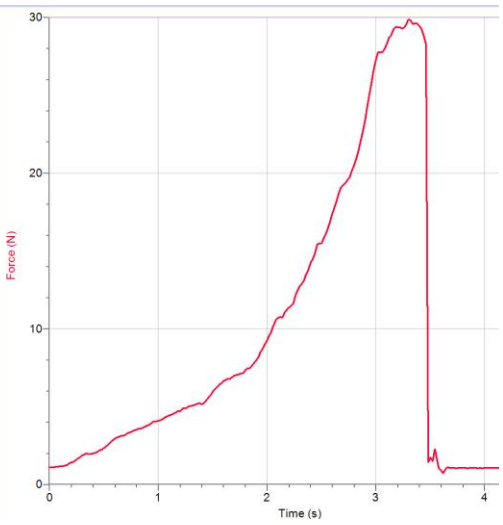


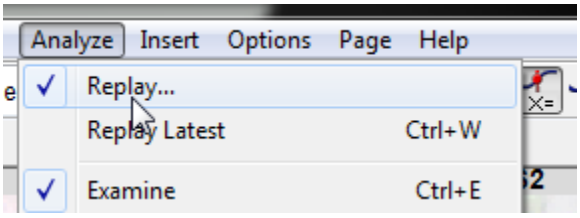

17. Use Auto Arrange to be able to see all the elements on the screen.

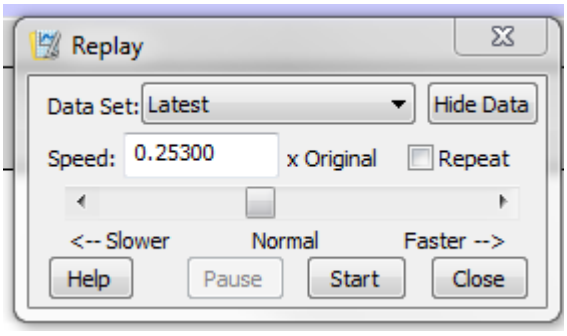




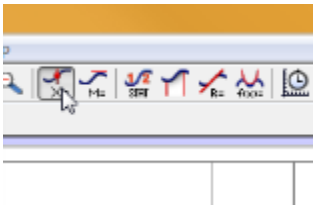



18. You can use the Replay feature to watch the video synched with graph.

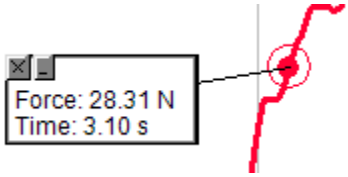


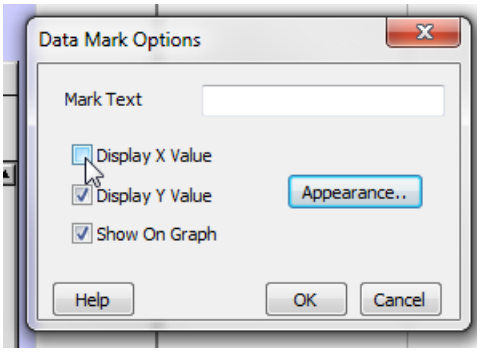
19. Use the examine button to observe forces at different places on the graph.

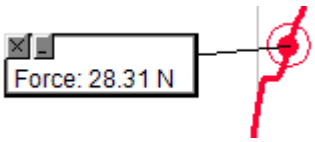


20. Using the examine function roll over the graph until the video frame is the last one before the truss failed and press the D key for Tag Data. This will label largest force on the graph before failure.




21. Double click on the box with the Tagged Data and uncheck the option to display X (Time) data.




22. Save your file in the location designated by your instructor.

23. Choose Print and include your name other information designated by your instructor. In printer properties change the orientation to landscape.