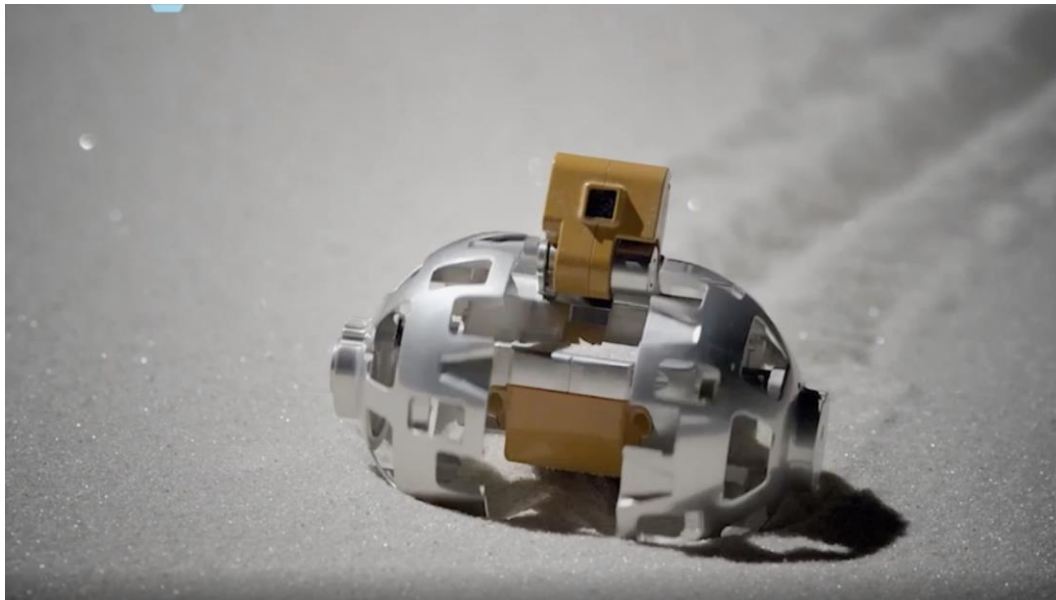
Ejecting Robot

- **JAXA does some cool stuff that should excite the world!!**
- **Japanese toy company, Tomy, built a Lunar Robot that deploys from the JAXA Lunar Lander and takes a picture of the landing.**
- https://www.youtube.com/watch?app=desktop&v=F9ImPb8EnPU
- The JAXA robot is the size of a baseball and 9oz.

Project:

- **Design, build and test** a small robot and the system that ejects a robot from the lander and takes a picture:
  - The robot needs to weigh no more than 15 oz.
  - The robot can expand bigger than 4”wide x 6”deep x 5”tall after being ejected if desired.
  - The robot needs to be able to survive a 6 ft drop into dry sand
  - The robot will take a picture of the surroundings—including the lander
  - The storage container on the lander has internal dimensions of 4” wide x 6”deep x 5” tall.
  - The storage container needs to hold the robot in place during the flight from Earth to the moon.
  - The storage container must release the robot and eject your robot from the lander between 24” and 36” from the lander.

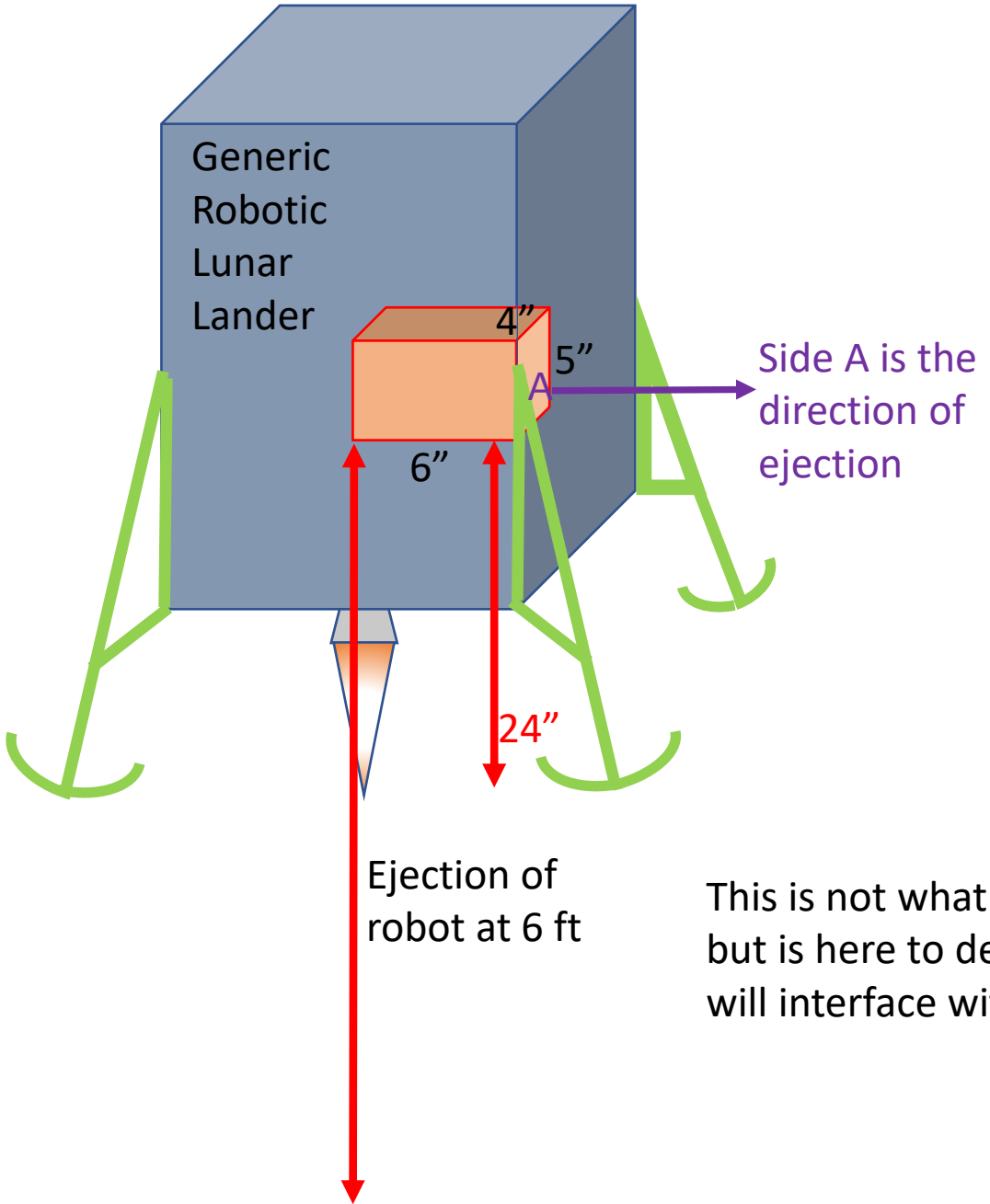


These are not robot requirements. These are the mission objectives. I’m trying to limit the size of battery and motor needed to keep the weight down but still allow you to use off the shelf parts.

- operates for an hour on its own (verify with data)
- travel up to 100 ft. in dry sand (verify with data)
- **Your robot does not have to look like the one Japan made.**

- HUNCH requirement—maximum dimensions of 4”wide x 6”deep x 5”tall , 15oz (trying to allow for off the shelf components)
- The interior of the ejection box needs to protect your robot from damage caused by launch vibrations
- All components must be within the box

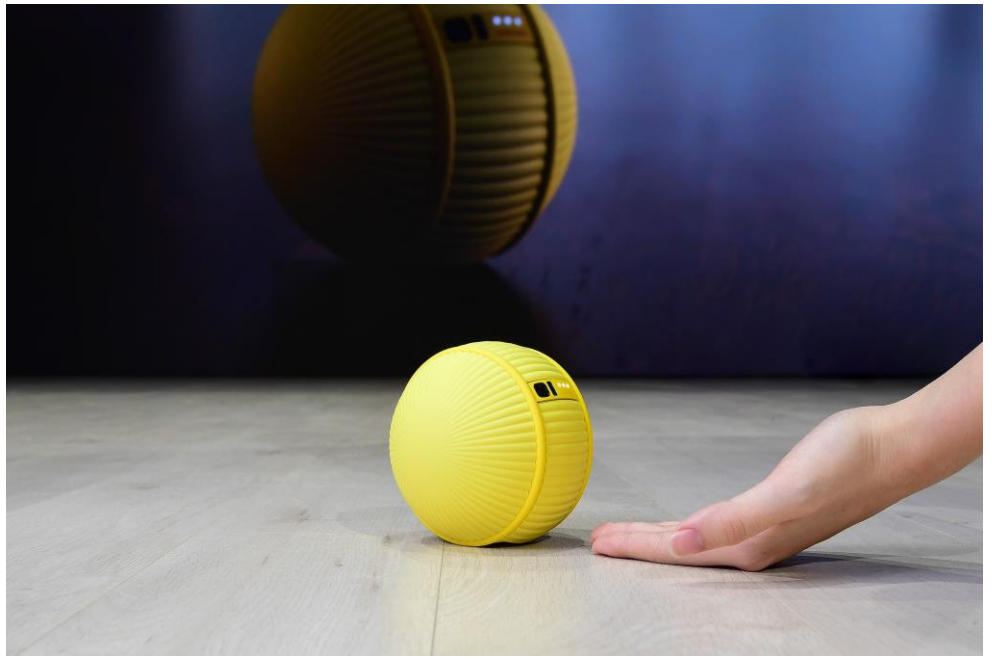
Location of robot on the lander



- The initiation of the ejection system can be done manually but it must be ejected by some mechanism contained in the system. (can’t just be pushed out by a hand).
- The robot could have a mechanism that allows the ejection system to start
- Your storage container/ejector can contain materials that are not related to the robot’s weight
- The force of the ejection should push the robot between 24” and 36” from the landing spot
- Assume your robot is falling in lunar gravity.

This is not what the lander will look like but is here to describe how your robot will interface with the vehicle.

All of these are too big and heavy to do our job but they have good ideas. They also would not survive the temperatures on the moon or they may not do well in sand. You can print your robot with ABS, PLA or whatever you have but when you report your weight, it has to be i**n the materials you want to use for the moon.** I expect that the plastic parts you may print would be thicker for strength than the metallic parts would need to be. You may need to shell some of your parts to represent them in a sheet metal.



Problems to watch out for

- Fine grain sand can be very damaging to your plastic parts, getting into joints. This is one of the major difficulties of lunar equipment.
- Batteries can be very heavy. This doesn't need to survive for a long time. Try to keep the size down.
- This doesn't need to be fast. Keep the motor size appropriate for its job.
- Can you send the picture to your phone?

Fun and inspirational robot builders

The project is only the ejecting robot for the moon. These are intended only as inspirational not part or suggesting other ideas for the project.

Jumping Robot

- https://www.youtube.com/watch?v=daaDuC1kbds

Air robots

- https://www.youtube.com/watch?v=UMFd4Blkjtc

Lego Submarine robot

- https://www.youtube.com/watch?v=KLEH8RJsYgI&t=226s

- **Lunar Ejecting Robot requirements (not final but a good reference)**
- Demonstration procedure: The robot and containment box are positioned 6 feet above the floor and ejected onto a surface of sand at least 3 inches deep. The robot/ containment box must have a mechanism for ejecting the robot. Teams may release a latch/ lock on the box to start the demonstration. After landing in the sand the robot must drive itself in the sand for 30 seconds, Take a photo of its surroundings and transmit that photo to a laptop/cell phone.

1. Does the robot fit inside the 4”x5”x6” ejection box?
2. Does the robot weigh no more than 15 oz?
3. Did the robot demonstrate mobility in the sand for 30 seconds?
4. Did the robot take a picture of its surroundings?
5. Did the robot transmit the picture to a laptop/cell phone?
6. Is the design and construction easily reproducible?

- Comments: