

1.1 Customer Needs

1.2.1 Customer Needs Overview

Customer needs are the attributes that a customer wants in a product. To satisfy those needs, Team 518 generated questions and developed engineering interpretations based on responses. The questions were generated from what the project brief left uncovered. Sponsors responded to those questions via Microsoft Teams. The interpretations based on those responses define what the product does but not how.

1.2.2 List of Questions and Interpreted Needs

Question	Summarized Sponsor Response	Interpreted Need
What kind of data are you looking to obtain from Team 518's research?	Looking for different scaling effects on crater geometry.	The team will produce experimental results of the effect scaling has on crater geometry.
What kind of measurements should our team take?	Measure the crater geometry, i.e. the diameters and depths.	The experiment will measure the depth, area, and profile of the crater created from the jet.
What parameters should our potential soil simulant replicate?	Ideally very fine, sand at ~70-100 microns or possibly regolith simulant (regolith simulant unlikely – many more safety considerations would need to be taken)	The experiment will use fine sand that mimics lunar dust, but not regolith stimulant. The sand will be between 70 and 100 microns.
How should we vary rocket sizes to obtain relevant results?	Don't scale with exit geometry exclusively. Have length/ scale correlations. Make sure it is high enough to have the jet highly underdeveloped. Keep area ratio and h/d fixed.	The experiment will only change the scale of the nozzle and not the ratio of entrance area and exit area of the nozzle.
What atmospheric conditions should our team use during experiments?	Atmospheric, room temp. Ideally, we'd move to reduced atmospheric pressure but seems like a bit much for our lab's capabilities. Fixed plenum condition.	The experiment will have fixed atmospheric properties.

Should we provide simulation evidence?	No, NASA only lacks physical evidence.	Team 518 will only be providing data based on physical measurements.
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1.2.3 Explanation of Results

As Team 518 asked questions, our sponsors also asked questions so that they could further explain their needs. The team is actively researching FSU's facilities for information that could help to clarify the customer needs further, therefore these needs are subject to change in the future.

From the results, Team 518 can conclude that we need to perform experiments where the only dependent variable is the crater geometry. The only independent variable that will change is the scale of the nozzle so that the direct correlation of crater geometry and scaling effects are shown. Our constant variables will include sand composition and atmospheric conditions, such as pressure, temperature, and gravity.