Task 3: FVD Test Plan Summary

At a high level, the Fall Validation Demonstration (FVD) will seek to demonstrate the CraterGrader worksystem's capabilities at a fully autonomous capacity. Details of the FVD test procedure are shown below.

Test Name	Fully Autonomous Grading Demo (FVD)	Test Number	11
Objective			
Hit worksite specifications defined in Project Requirements per Team A Project Management Review 2022. This can be written simply as a full autonomous operation to grade, level, and smooth unstructured lunar-like terrain.			
Elements	Mapping, Perception, Planning, Control, and Localization		
Location	GHC Sandbox		
Equipment	CraderGrader robot, Robotic Totalstation + Secondary Computer, External Positioning Beacons, Worksite AprilTags, External Power supply & Tether (Possibly Deprecated)		
Personnel	5 persons: 1 autonomy engineer, 1 vehicle engineer, 1 videographer, 1 verbal commentator, 1 visualization engineer		
Procedure			

Night before:
1. Pre-FVD vehicle checks are conducted.
2. The sandbox worksite is set up with a crater topography.
3. A FARO prescan is taken and saved for V&V.

Day of:
4. Visualization is set up on the visualization engineer's computer, screen-shared to TV monitors.
5. The CraterGrader robot is powered on in the sandbox.
6. All necessary nodes are launched.
7. Diagnostic checks through Foxglove are done, continuous monitoring begins.
8. Robot conducts mapping pass autonomy when given a start command.
9. Robot proceeds to perform a full grade of worksite.
10. FARO scan of worksite is taken and pumped through cloudAnalysis scripting for V&V

Verification Criteria

1. The system will start and finish its operation in a worksite with a ≤ 1 deg total fit plane grade as measured against the gravity vector.
2. The system will smooth the entire worksite to at most ± 3cm height variation from fit plane, with a height standard deviation of at most 1 cm from fit plane.
3. Initial and final maps are visualized and indicative of worksite state, pre- and post-grading respectively.
4. The system will perform operation autonomously with no interventions.