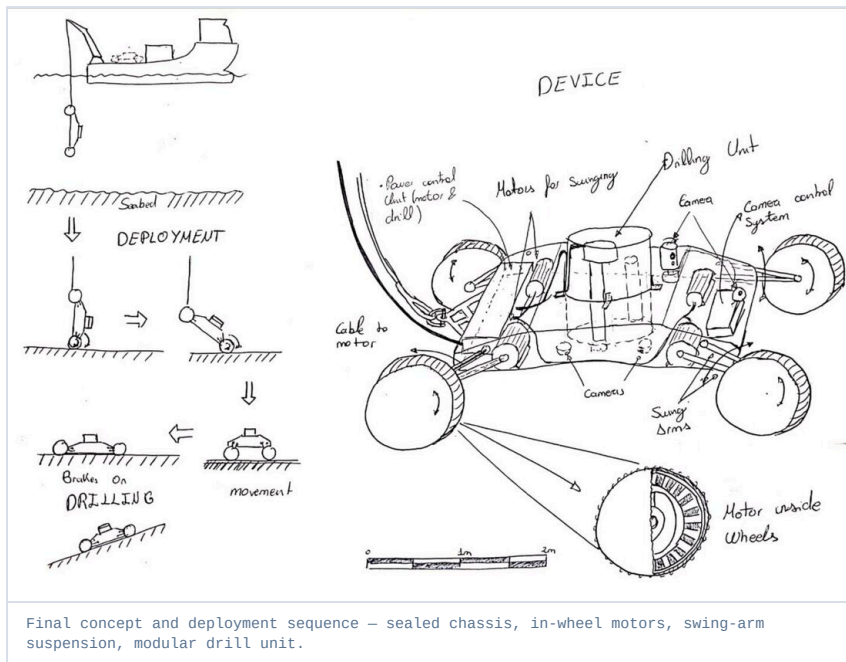


Seabed Drilling Rover

Embodiment design for a remotely operated tool that drills the ocean floor — a novel machine with no off-the-shelf precedent to copy.

THE STUCK PROBLEM

Develop an early seabed-drilling concept into a defensible embodiment design: size the components, choose materials, identify failure modes, and estimate cost — all under deep uncertainty.



CONCEPTS GENERATED

Architecture — sealed chassis + modular drill. A cable-and-winch-deployed sealed chassis, with the drill mounted on silent-blocks like a car engine, isolating vibration and keeping the design modular.

Mobility — in-wheel motors + swing arms. Four independent in-wheel motors, with Mars-rover-inspired swing-arm suspension that adapts to uneven seabed and locks flat while drilling.

Material & process selection. Ashby-chart selection against explicit objectives — leak-before-break for the chassis, hardness and corrosion resistance for the wheels, flexibility-without-failure for the arms — each paired with a realistic manufacturing route.

DE-RISKING THE DESIGN

- **Cost model:** bottom-up estimate by subsystem, with adaptation factors for bespoke development.
- **FMEA:** every subsystem rated severity × probability — surfacing the winch cable and the chassis seal as the risks to control first.