

# MINIATURE LOW-POWER ULTRASONIC CORE DRILLER (UTCD)

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## PARTICIPANTS

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**Industry** - *Cybersonics*, Tom Peterson and Ron Krahe



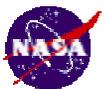
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### OBJECTIVES

- Develop UTCD to support Mars Exploration missions screening & sampling, overcoming the existing technology limitations of the Robotic Drilling task.
- Enable probing, sensing and sampling capabilities.
- Develop UTCD prototype with signal generator weighing  $\leq 300$ -g fitting in an envelop of  $\leq 4 \times 4 \times 2$ -in.
- Demonstrate the coring of 7-mm diameter, 30-mm long sample from a basalt rock using axial loading that is  $\leq 3$ -5% of the rover mass.

### SCHEDULE

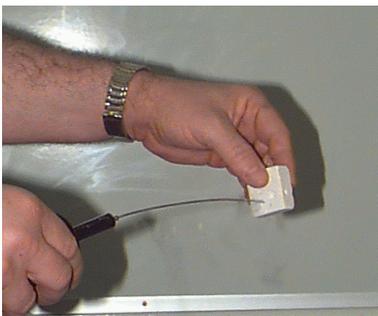
- FY'99 Develop breadboard miniature, low power UTCD. Model ultrasonic coring and experimentally corroborate. Investigate drilling, probing, sensing and sampling.
- FY'00 Develop prototype with feedback loop control accounting for the effect of mechanical and thermal loads. Integrate selected sensor suite. Develop mechanism of collecting formed dust for in-situ analysis.
- FY'01 Examine the performance of the UTCD prototype at cryovac conditions and make necessary modification to adapt it to operation at Mars environmental conditions. Integrate UTCD prototype into a rover unit and demonstrate deployment, coring, sensing and sampling.



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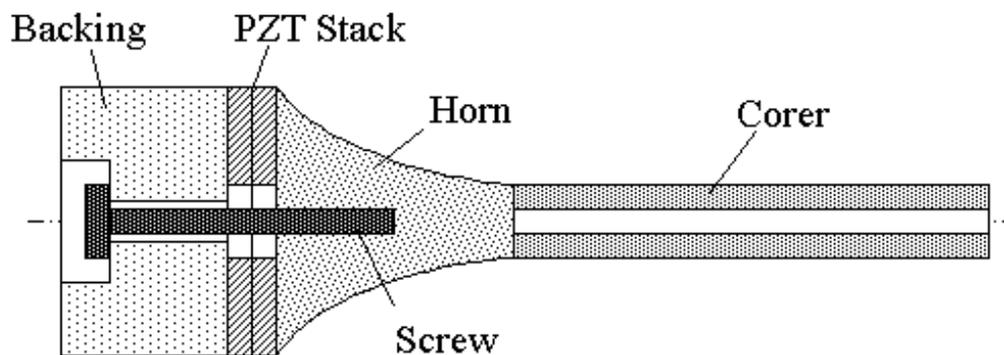
Ultrasonically drilled rocks



Actuator and sting



Lithotripsy unit with actuator and sting



General view of the corer actuator and end effector