Everything option

- Orbiter with 2 penetrators + 2 CubeSats
- 2 CubeSats = 1 impacter + 1 chaser, launched into highly elliptical orbit
- Orbiter deploys the penetrators, they go in
- Impactors targeted near the probes. The penetrators have optical sensors and seismometers to observe the impacts
- The orbiter watches the impacts as well.
- The orbiter is a data relay for the penetrators

Less-than-everything options

Penetrator

- Never been successfully tried, DS-2 orbiter failed
- In-situ instruments with longer observing time
- Need data relay
- Larger mass and cost?
- Development cost – instruments must survive impact

Impactor

- Known to work – LCROSS, deep impact
- Remote sensing only
- Illumination problems
- Short integration times
- Possible with CubeSats
- Off-the-shelf remote sensing instruments

Finding the lesser weevil

Penetrator

- No guarantee of finding water w/o precursor
- Sensitive to H2O trace
- D/H, O isotopes
- Impact chaser could be a penetrator as well
- Must get to Moon and then slow down
- Dedicated launch

Impactor

- No guarantee of finding water w/o precursor
- Less sensitive to trace
- Organics, O isotopes
- Chaser could do in-situ like Cassini INMS, CDA
- Must escape Earth orbit – that's all
- Quick and cheap to piggyback two 6U's

An estimate of the detection capability of the MIRO spectrometer can be obtained by computing the column density of molecules needed to produce a given line temperature. Column 3 in Table 5 shows the minimum detectable column density necessary to produce a line strength of 2 K assuming a gas temperature of 300K.

Molecule	Frequency	Minimum Column Abundance (number/cm^2)
H_2O^{16}	556.9	1×10^{13}
H_2O^{17}	552.0	1×10^{13}
H_2O^{18}	547.7	1×10^{13}
NH_3	572.5	6×10^{13}
CO	576.3	1×10^{15}
CH_3OH	553.1	1×10^{15}
CH_3OH	568.6	1×10^{15}
CH_3OH	579.1	7×10^{14}

TABLE 5: Minimum detectable column densities to produce a line strength of 2 K assuming a gas temperature of 300 K.