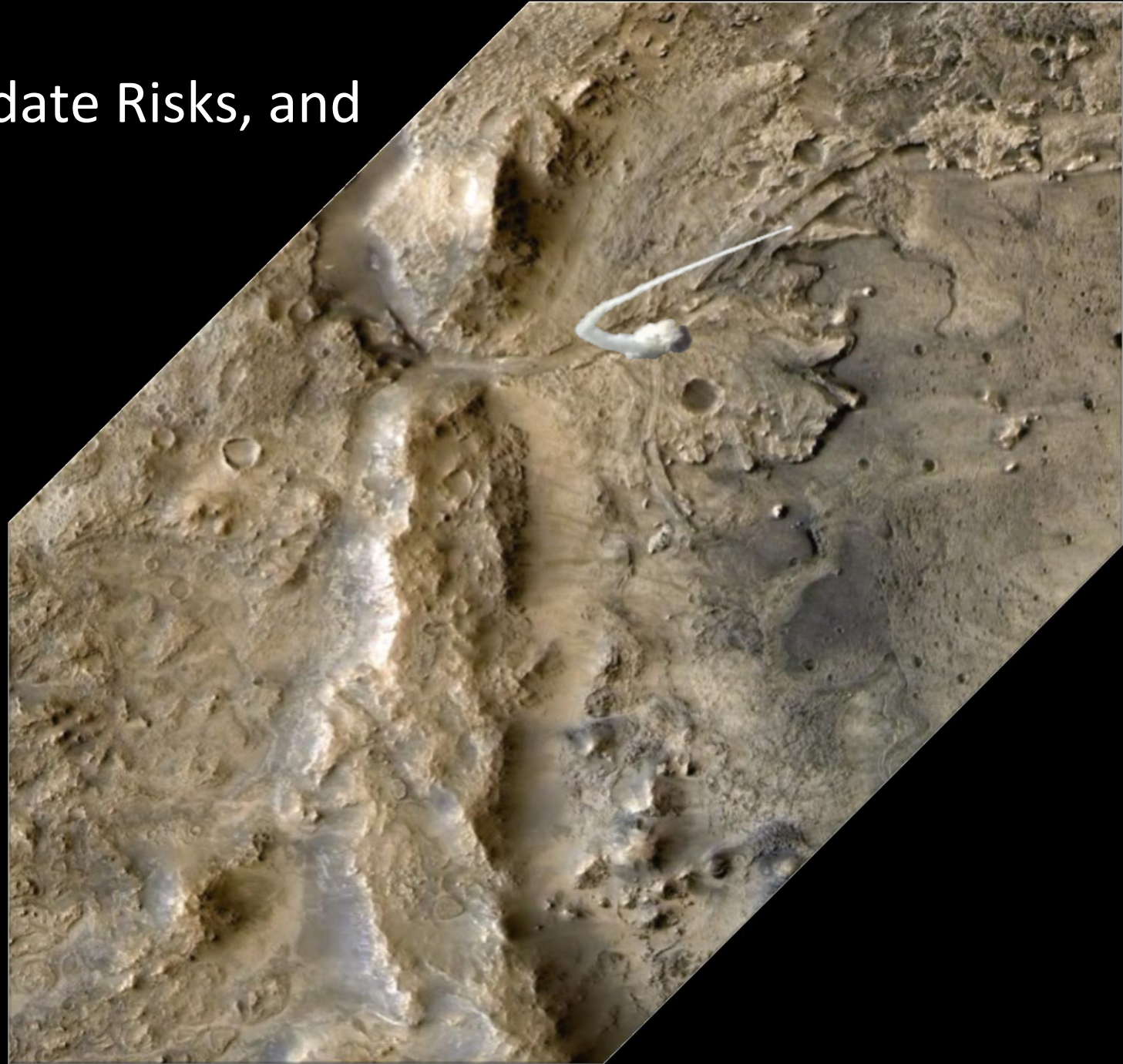


Overview of MAV Risks, Candidate Risks, and Subsystem Concerns

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- Unguided 2nd stage extremely sensitive to mass properties, spin balance configuration, and post-spin balance uncertainties
- Added analytical complexity in modeling unguided 2nd stage performance including need for extensive model credibility enhancement; select models such as those for Energy Dissipation are not easily validated
- Tight Orbital Sample (OS) delivery requirements, e.g., spin rate; spin energy; delta SMA; minimum periapsis/apoapsis, drive hardware and software complexity, mass, and risk
- Limited attitude/rate sensor options that meet performance requirements with heritage and high reliability driving solution to 'heavy' MIMU; MAV MIMU use case is atypical in that it is not explicitly designed to support operation while subjected to MAV operational environments; necessitates developmental testing
- VECTOR toss induced loads higher than anticipated and applied to MAV in lateral orientation (lateral loads on propellant and RCS tank of concerns)
- Automated launch sequencing places strong dependency on accurate timing sync and time propagation between SRL and MAV; LCC evaluation automated by SRL for go/no-go; umbilical separation and MAV Bay Door (MBD) opening are nonreversible events
- Long duration beacon operation and frequency stability requires tight thermal stability with utilization of heaters and associated battery power in mass constrained MAV; beacon operation for Orbital Determination coupled with optical detection for robustness
- Single string avionics (1st stage flight computer; MIMU; etc.) necessitated by mass constraints drives high heritage, more mass extensive solutions
- Vehicle level validation opportunities happen late in project lifecycle, are potentially very costly, and would encounter numerous TAYF exceptions; piecewise V&V employed but has the potential to leave knowledge gaps
- Tight volumetric constraints on the MAV from SRL due to EVT size constraints and potential interferences with RTG
- Time from propellant pour/cure to Mars ascent potentially long driving need to characterize propellant aging; concerns exist with long duration aging associated with baseline CTPB (cold temperature capable) propellant; would need to be characterized for alternative HTPB compatible with SRL-RTG
- Unverified root cause for RAD750 v3 failures; RAD750 v2 utilized in MAV avionics (CAGE) not exonerated
- OS design volatility translating to MAV design volatility