Titan Architecture Baseline Options

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Mission Architecture Options

Interplanetary Trajectory	Saturn Orbit Insertion	System Science Tour	Titan Pumpdown Tour	Titan Orbit Insertion	Titan Orbits	Disposal	InSitu element release timing
Direct Chemical	Chemical Only	None	SOI+6 months	Chemical Only	Circular	Burn up on Titan Entry	Pre-SOI
ISSGA - Chemical	TGA - Chemical	Equatorial	SOI+15 months	Chemical + Aerobrake	Elliptical and Aerobrake to Circular	Escape Titan	Between SOI-TOI
ISS/J/GA - Chemical	Titan Aerogravity Assist	High Inclination	REP	Aerocapture	Elliptical Only	Sterilize & Land	Immediately Pre-TOI
ISSGA - SEP	REP	Cycler	Aerobraking		Loose Elliptical	Escape to Tour	Post TOI
ISS/J/GA - SEP		Leveraging			Low-Speed Flyby		
					High-Speed Flyby		

- Mission Design choices would be determined based on science objectives and time and Delta-V constraints
- Work is presently underway to determine durations and Delta-V cost of each element in the above table
- Current assumptions are that full mission would require Delta-V of ~2500-2700 m/s, allowing dry mass on the order of 1500 kg in Titan orbit (using Atlas V)

One Possible Architecture

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2006 TiPEx Study

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2007 Titan Explorer Study

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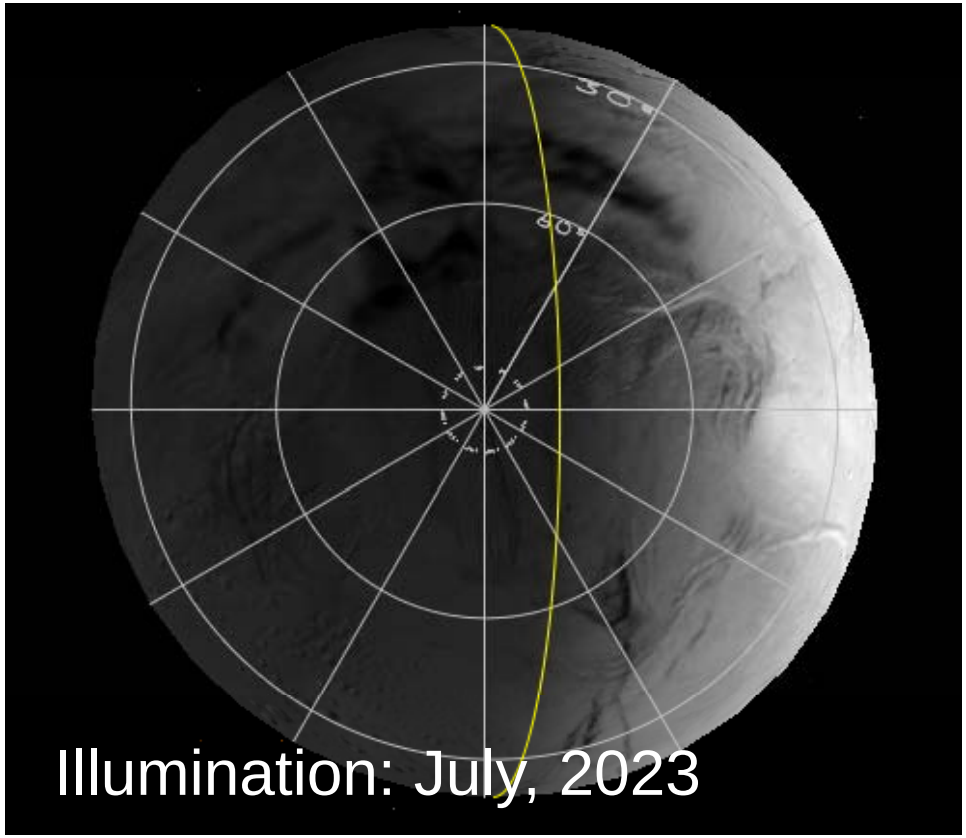
Probe Delivery Baseline Options

- Prior to SOI
  - 2.2 to 2.5 times the mass of post-TOI delivery
  - Range of link during entry ~ 2e6 km
  - Landing footprint: 150 km x 111 km (*3-sigma from TE study*)
- After SOI and PRM
  - 1.6 to 1.9 times the mass of post-TOI delivery
  - Link during entry like Cassini-Huygens
  - Landing footprint like above
- Immediately Prior to TOI
  - ~1.1 times the mass of post-TOI delivery
  - Good link
  - Landing footprint like above
- After TOI
  - De-orbit DV ~40 m/s during aerobraking phase, ~100 m/s after
  - Good link
  - Smallest footprint

Enceladus Lighting

- Autumnal Equinox: May 2025
  - i.e. Southern Winter before 2025
- Arrival would be from 2022-2025
- Enceladus South Pole poorly illuminated



Questions for the SDT

- Nature of Saturn science
  - Enceladus flybys
    - How close
    - How many
    - Cassini like good enough
  - Other moons
  - Ring science (assuming none)

- Titan orbit baseline requirements
  - Low circular orbit?
  - Different types of orbits needed
  - Saturn science from Titan orbit

Questions for the SDT

- Instrument accommodation
  - Power, mass, data rate
  - Pointing, stability requirements
  - Need for slews
- Nature of the in-situ payload
  - Lifetime
  - Data rate
  - Need for landing precision
  - DTE communications capability
  - Operations concept