Outer Planet Flagship Missions with ARM-derived Electric Propulsion Stage

Damon Landau and Nathan Strange: Jet Propulsion Laboratory, California Institute of Technology

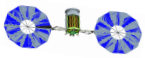
ARM-Derived Mars SEP Stage

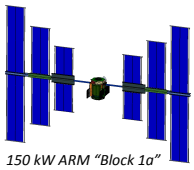
The Asteroid Redirect Mission (ARM) would develop a high power Solar Electric Propulsion (SEP) vehicle that would be extensible to a 150 kW SEP tug (the ARM "Block 1a" vehicle) that could deliver up to 70 t of cargo to Mars for human spaceflight missions.

Two advanced Solar Array Technologies are being considered for ARM. Both allow the ARM design to be scaled up to the power levels needed for Mars mission with minimal modification of the ARM vehicle.

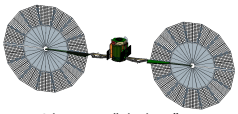
Asteroid Redirect Vehicle with ROSA arrays

Asteroid Redirect Vehicle with MegaFlex arrays





150 kW ARM "Block 1a" Mars tug with ROSA arrays



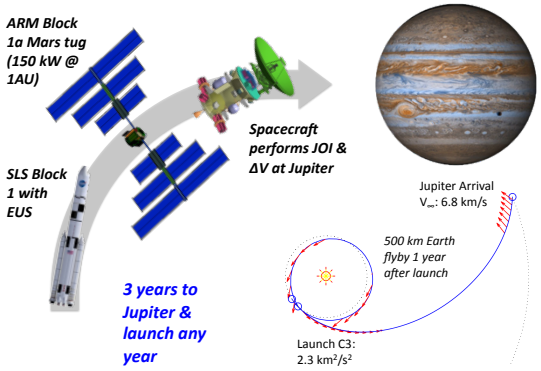
150 kW ARM "Block 1a" Mars tug with MegaFlex arrays

SLS+ARM Jupiter Flagship

SLS+ARM could deliver 12,276 kg to Jupiter orbit in 3 yrs.

This is 2X the mass of a comparable chemical propulsion trajectory.

Jupiter Arrival Mass	23,870 kg
SEP Tug Mass	8,000 kg
JOI Propellant (bi-prop)	5,594 kg
Mass in Jupiter Orbit	12,276 kg

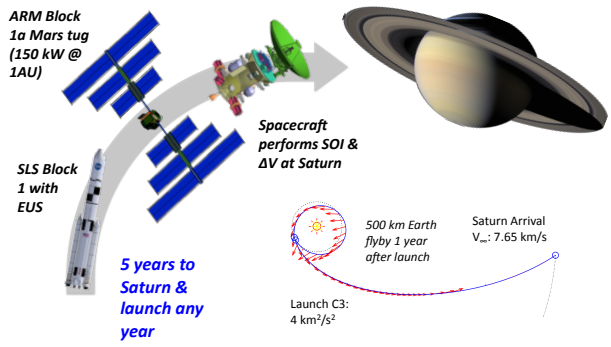


SLS+ARM Saturn Flagship

SLS+ARM could deliver 8,504 kg to Saturn orbit in 5 yrs.

This is 2.5X the mass of a comparable chemical propulsion trajectory.

Saturn Arrival Mass	21,000 kg
SEP Tug Mass	8,000 kg
SOI Propellant (bi-prop)	4,496 kg
Mass in Saturn Orbit	8,504 kg

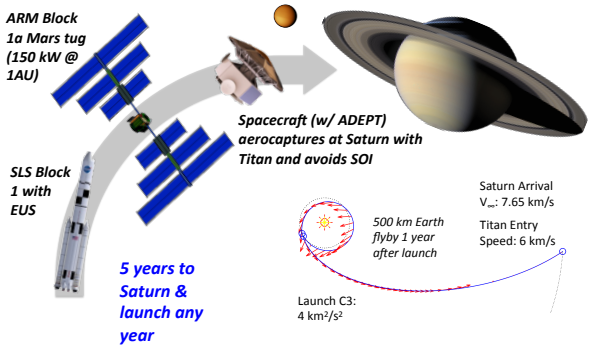


SLS+ARM & Titan Aerocapture

SLS+ARM with aerocapture could deliver 13,000 kg to Saturn or Titan orbit in 5 yrs.

This is 3X the mass of a comparable chemical propulsion trajectory.

Saturn Arrival Mass	21,000 kg
SEP Tug Mass	8,000 kg
Mass in Saturn or Titan Orbit	13,000 kg

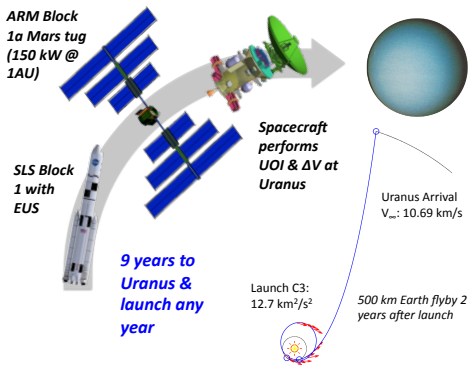


SLS+ARM Uranus Flagship

SLS+ARM could deliver 4,400 kg to Uranus orbit in 9 yrs.

This is 2X the mass of a comparable chemical propulsion trajectory.

Uranus Arrival Mass	21,060 kg
SEP Tug Mass	8,000 kg
UOI Propellant (bi-prop)	8,660 kg
Mass in Uranus Orbit	4,400 kg



SLS+ARM Neptune Flagship

SLS+ARM could deliver 4,500 kg to Neptune orbit in 9 yrs.

This is 3X the mass of a comparable chemical propulsion trajectory.

Neptune Arrival Mass	20,260 kg
SEP Tug Mass	8,000 kg
NOI Propellant (bi-prop)	7,760 kg
Mass in Neptune Orbit	4,500 kg