Propulsion Activities at JPL

Propulsion and Fluid Flight Systems
353 L
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Overview

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- Hybrid test facility
- CubeSats
- M2020 and
  - Skycrane
  - MOXIE
  - Dust removal
- Hybrid MAV technology

ISRU Hybrid

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- Filling oxidizer tank at Mars or on the way there
  - Incremental step towards ISRU – convert CO_2 into O_2
  - Byproduct of ECLESS operations
- Conducted tests of paraffin/SP1 with O_2/CO_2 mixtures

Test of a paraffin/gaseous oxygen motor at the JPL Test Facility

CubeSat/SmallSat Propulsion

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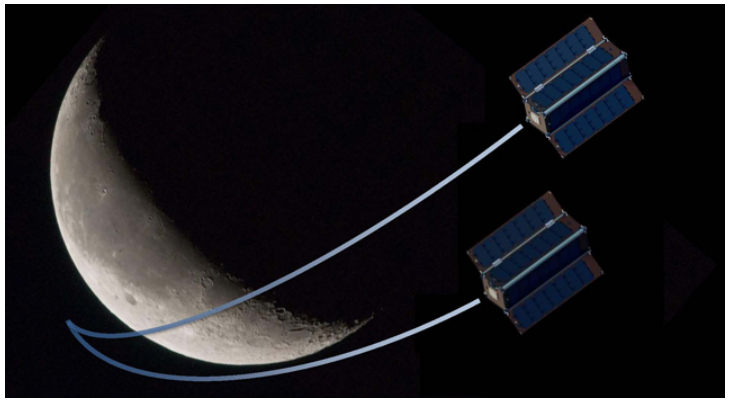
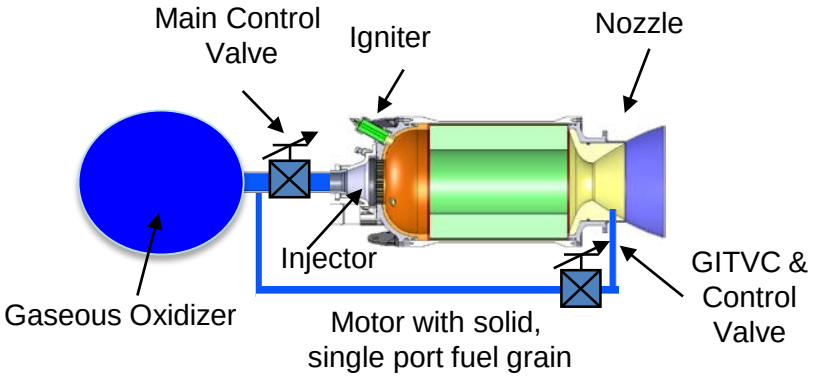
- Benefits
  - Capable of high thrust and delta V's required for orbit insertion <u>OR</u> low level thrust for station keeping
  - Ideal for ride sharing: "green," storable propellant options.
  - Many different fuels/oxidizers to choose from
  - Multiple starts/stops possible
- Challenges
  - Igniter development
  - Packaging





Mars 2020

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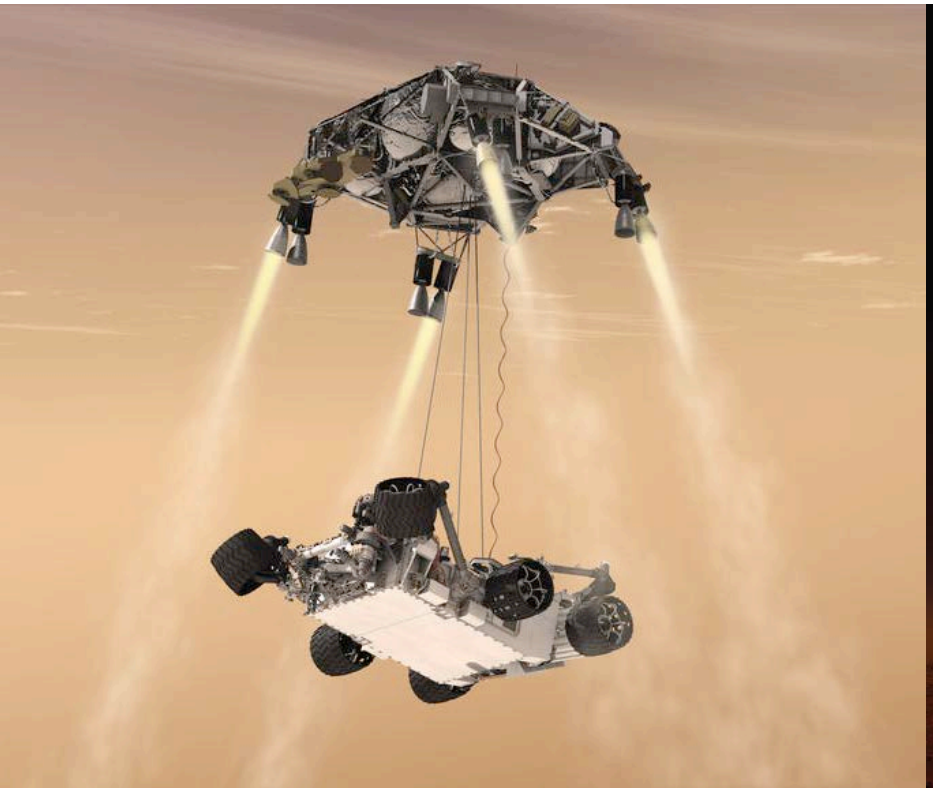
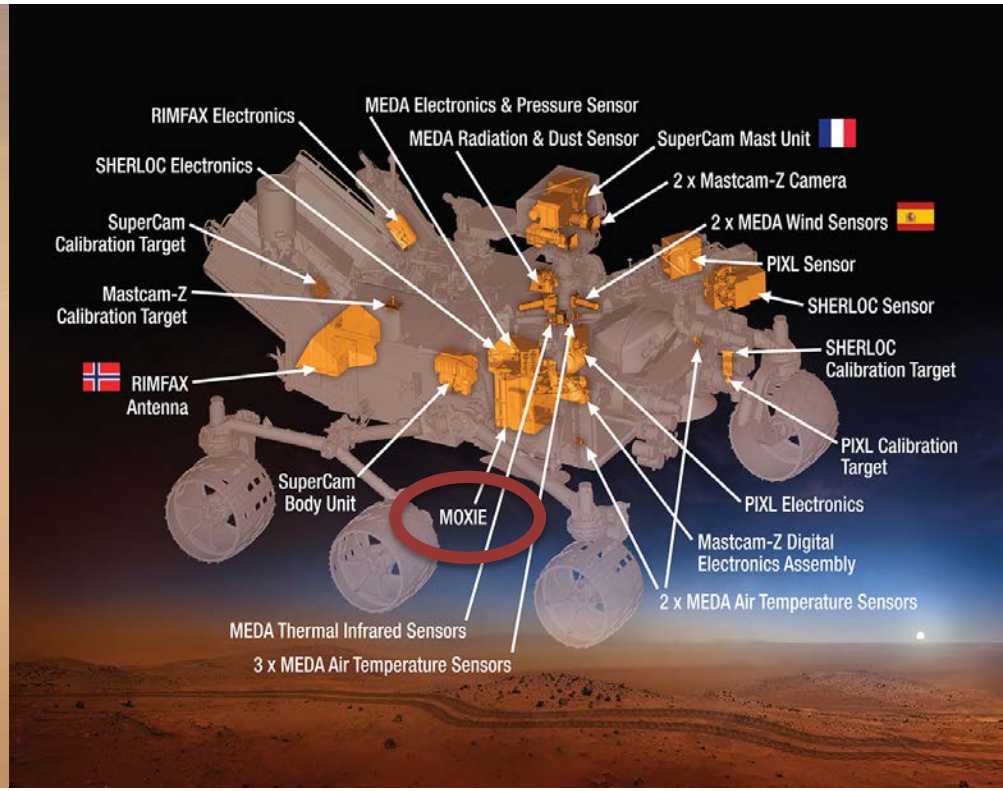
- Skycrane – MSL build to print
- Moxie
- Dust Removal (next slide)





Dust Removal Technology "DRT"

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- "Replace the brush"

$$\dot{m} = 299\ SCCM$$
$$h = 1.3\ cm$$
$$\Delta m = 0.99\ g$$

Hybrid MAV

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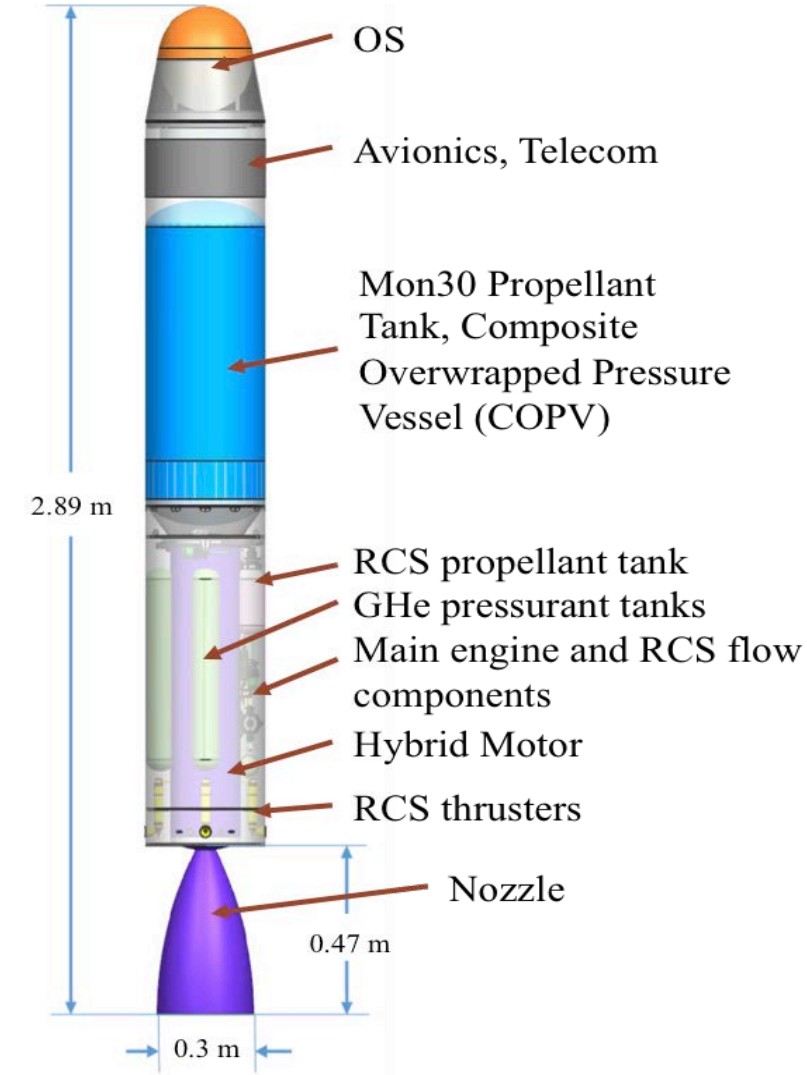

Hybrid MAV:

Wax based fuel (SP7) and MON25 hybrid motor
GHe storage pressure: 10 kpsia
MON Tank pressure: 400 psia
Chamber pressure: 250 psia
Thrust: 5800 N
O/F: 4.56
Length: 2.885 m
GLOM: 219.1 kg

Separate RCS operates at 1250 psia

- Currently: 4 x 22 N and 4 x 5 N thrusters
- Potential to reduce to 6 x 10N thrusters

Venus Sample Transfer

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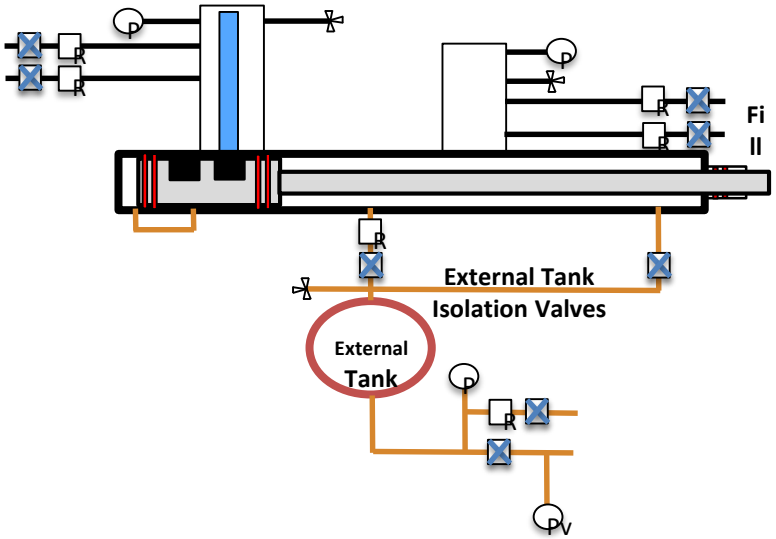
- Transfer mechanism
  - Reduce Venus atmospheric pressure so sample can be evaluated by instruments



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