Coronagraphy from Orbiting Platforms

Rémi Soummer

KISS workshop "Innovative Approaches to Exoplanet Spectra"

11/12/09

Coronagraphy and external occulters

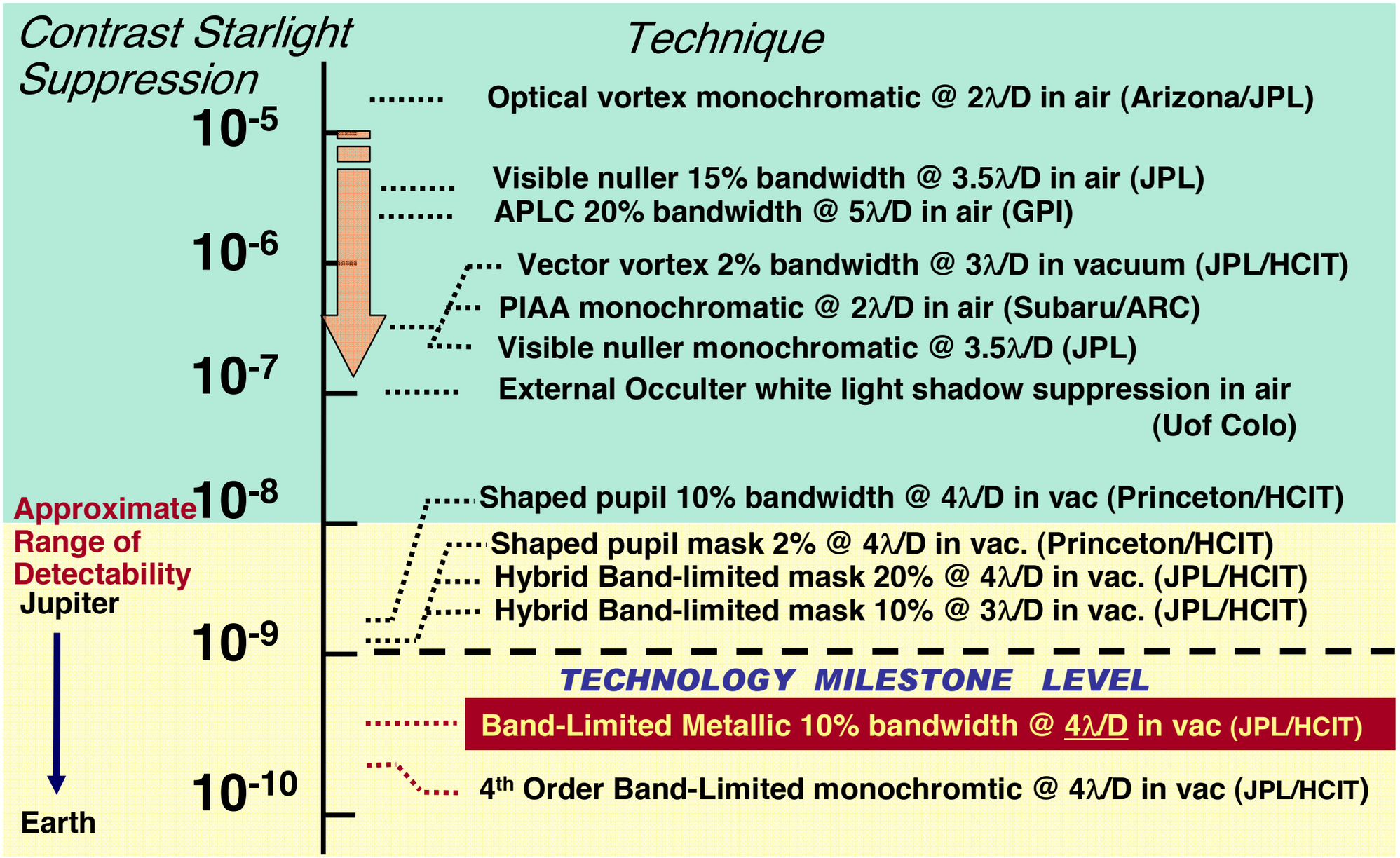
- Internal coronagraphs
  - masks, apodizers etc
  - deformable mirrors
  - wavefront control, stability

- External occulters
  - external starshade
  - deployment
  - formation flying

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

Starlight Suppression Status

ExoPlanet Exploration Program



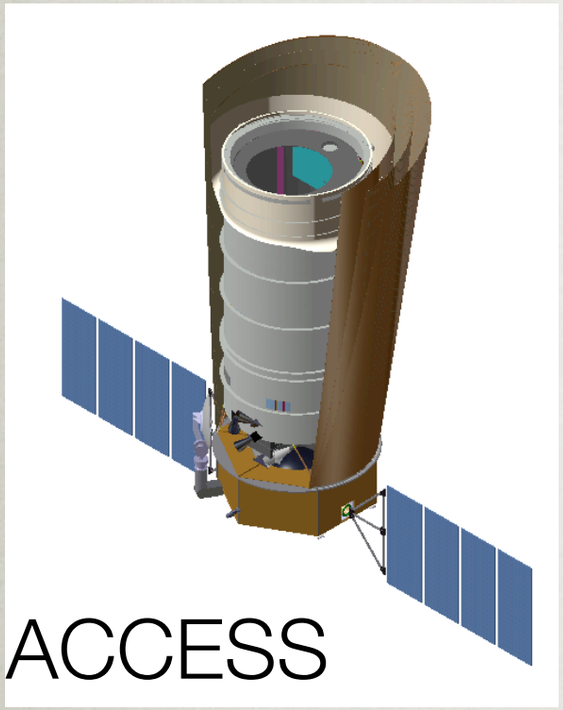
M. Levine, 2009

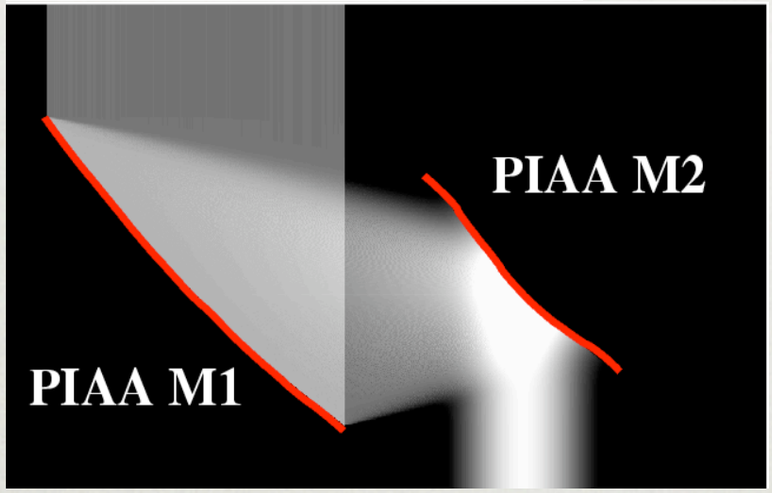
NASA mission concept studies (ASMCS)

- Several concept mission studies relevant to coronagraphy
  - ACCESS (medium, 1.5m)
  - PECO (medium, 1.4m)
  - EPIC (medium, 1.65)
  - DAVINCI (large, 4x 1.1m)
  - NWO (large, 4m + starshade)
  - THEIA (large, 4m + starshade)
  - ATLAST (large, 8/9.2/16m + coronagraph/starshade)

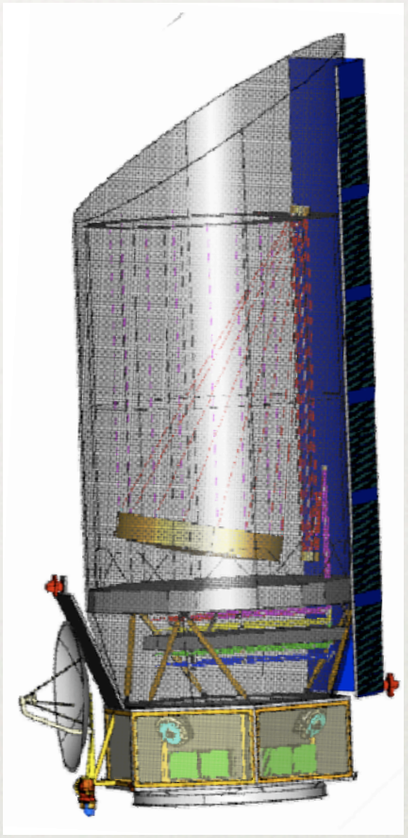
- Orbits: drift away heliocentric, L2

Medium size missions

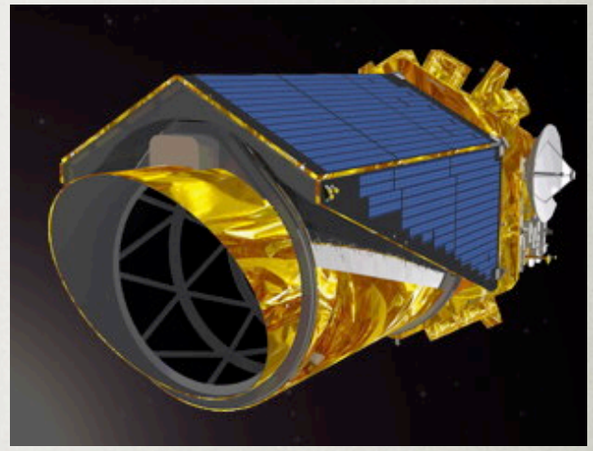


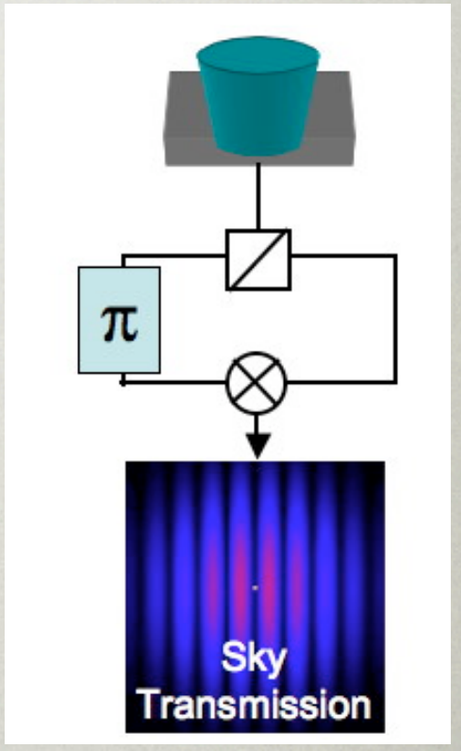


PECO



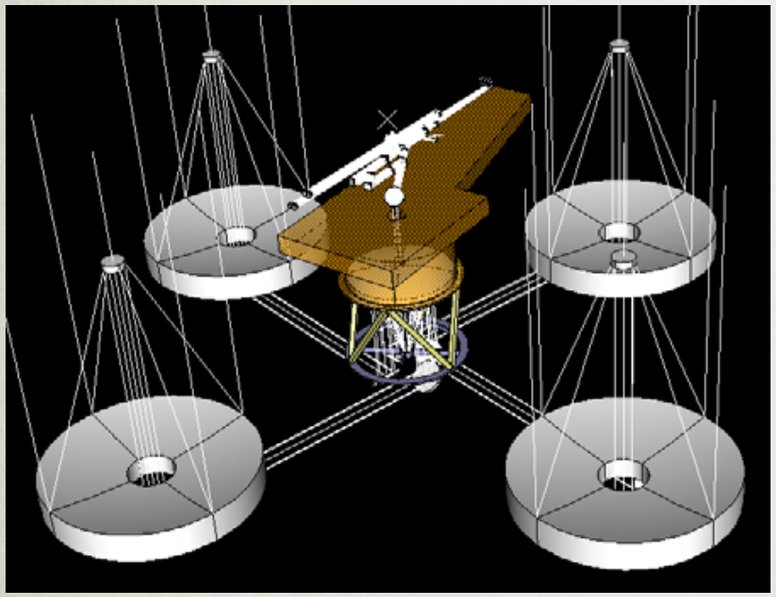
EPIC

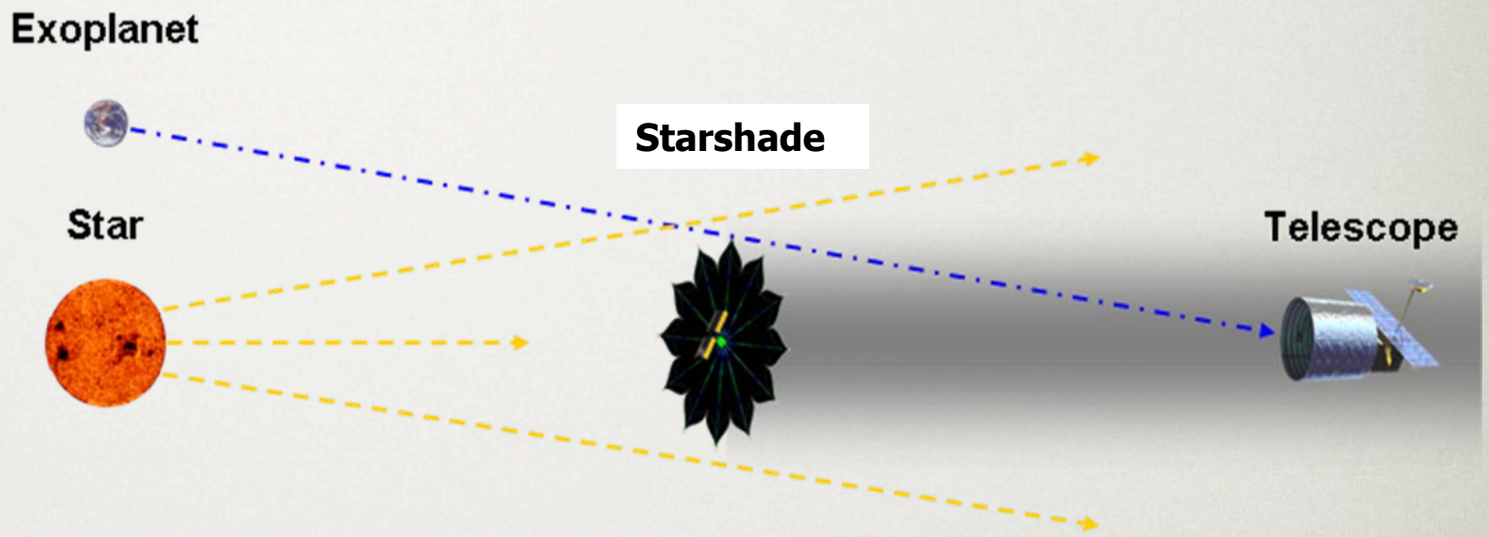




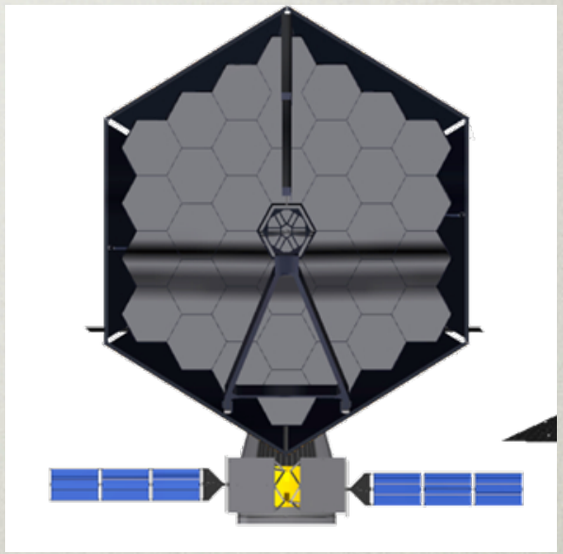
- Direct imaging of exoplanets
  - photometry, colors, low resolution spectroscopy
  - RV planets, Super Earths?
  - exozodiacal disks

large missions





- detection / characterization of terrestrial planets
  - enables spectroscopy
  - identify biomarkers
  - other planets, disks etc.



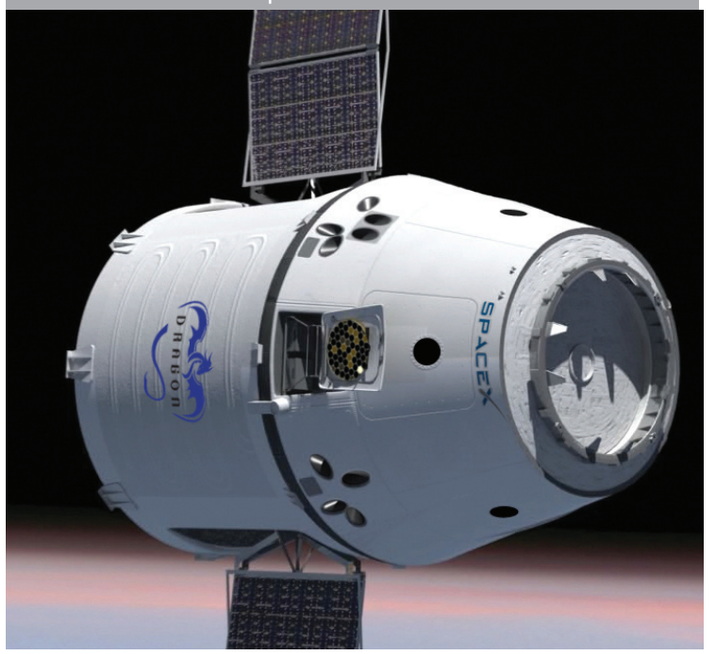
Access to orbit

- Dedicated launch
  - e.g. Atlas V, Delta IV
  - Ares V if developed
  - Commercial companies?
- Secondary payload
  - ideas for small payloads?
  - smaller coronagraphs?
- Technology development if access to orbit is cheap
  - starshade deployment
  - small telescopes
  - experiment with DM

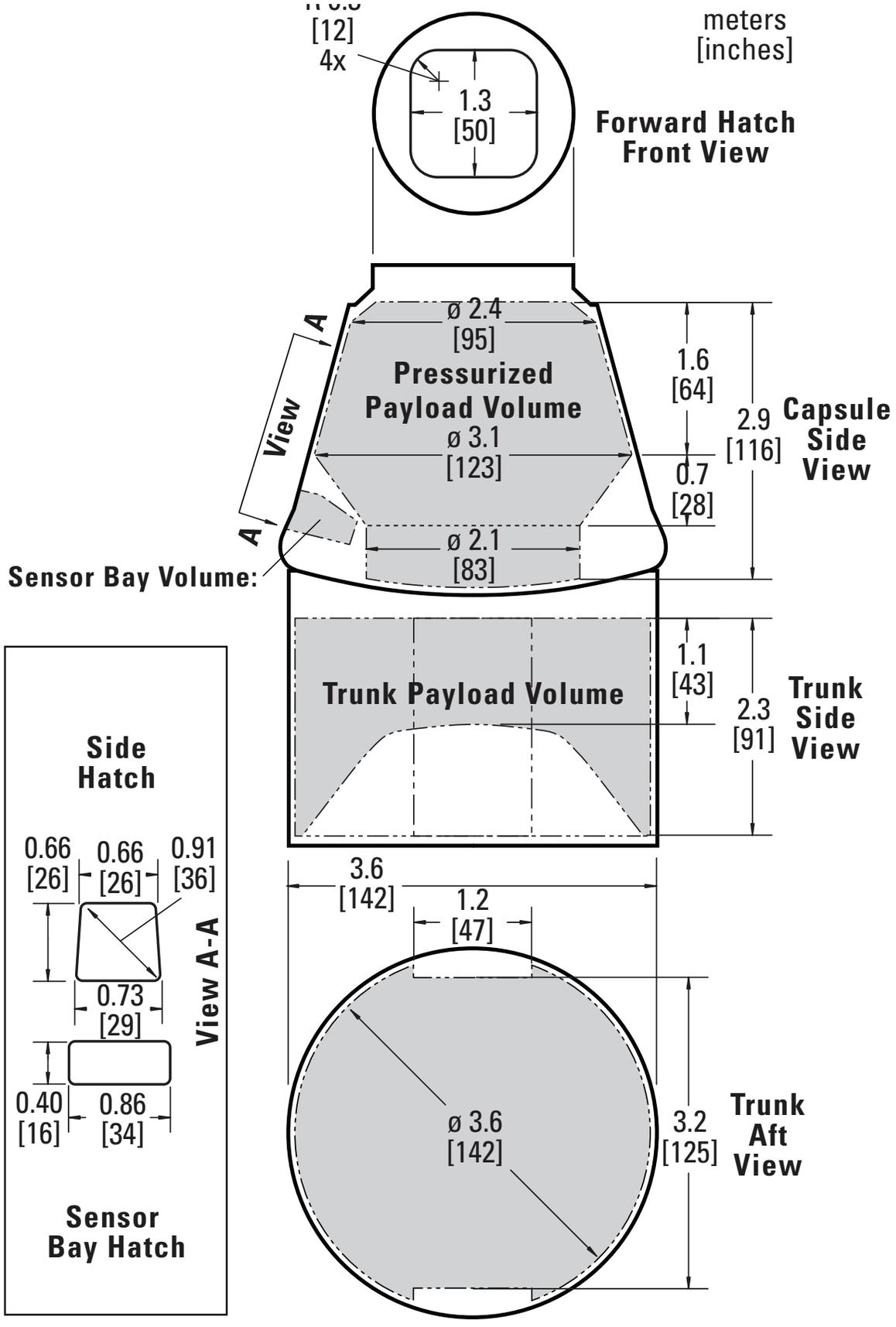
SPACEX

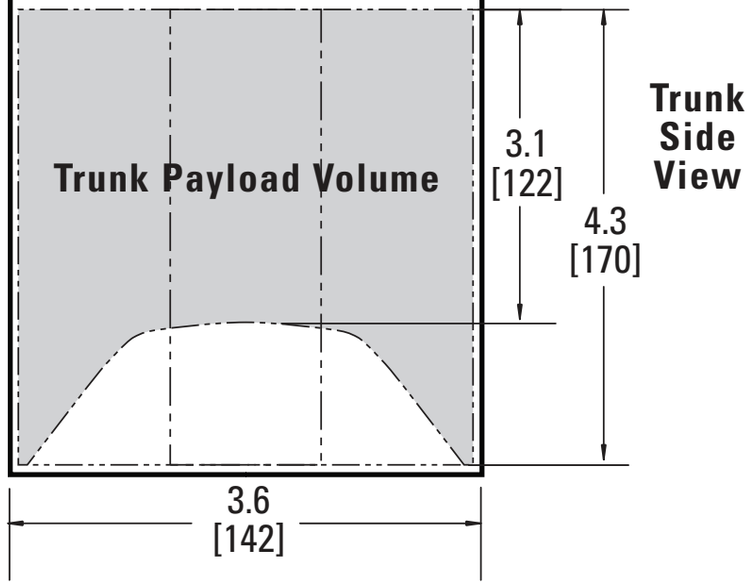
DragonLab™

Fast track to flight.



meters
[inches]





14m3
up to 34m3

new ideas?

- one year flight with extended sounding rockets?
- secondary payloads
- very small payloads?
- technology development if very cheap?