Advanced Cryocooler Technology Development Program (ACTDP)

Terrestrial Planet Finder Mission

TPF

Goal

Enable long-life cryogenic space-based observatories such as TPF

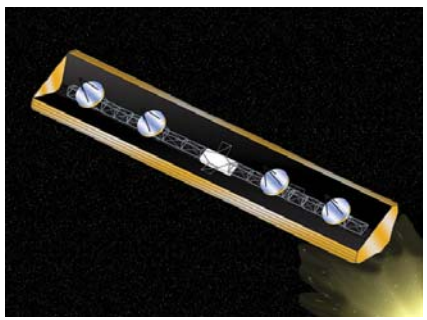
Objectives

Provide the technology base required to commit to and initiate flight cooler procurements around 2005-06 (enables flight h/w delivery in 2008-09)

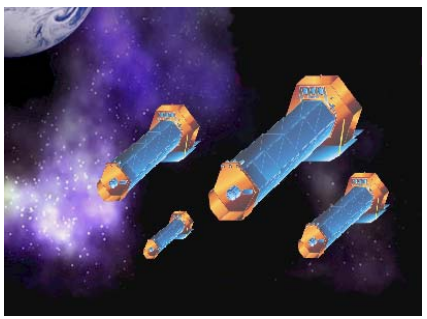
- Well developed flight requirements
- Proven / tested Engineering Model cryocooler designs
- Supporting engineering analyses and drawings

Work closely with potential customer missions on technology requirements

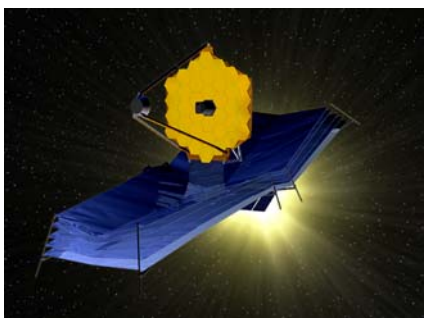
- 6 K / 18 K two-stage cooling
- Remote coldheads (for deployable structures)
- Minimal generated noise (EMI and vibration)



Terrestrial Planet Finder



Constellation-X



James Web Space Telescope / MIRI

A NASA Origins Mission

ACTDP Cryocooler Concepts

Terrestrial Planet Finder Mission

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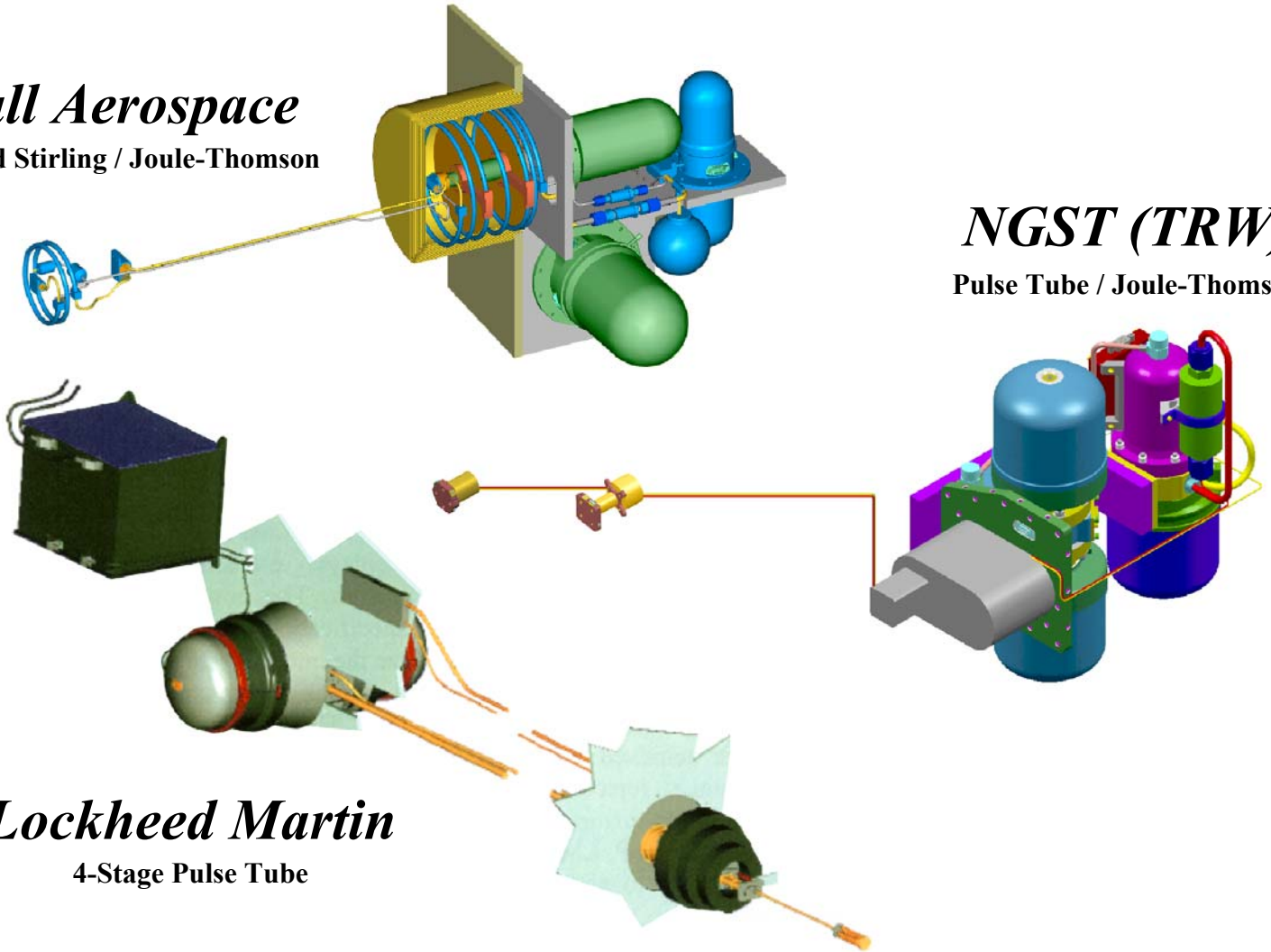

ACTDP Cryocooler Applications

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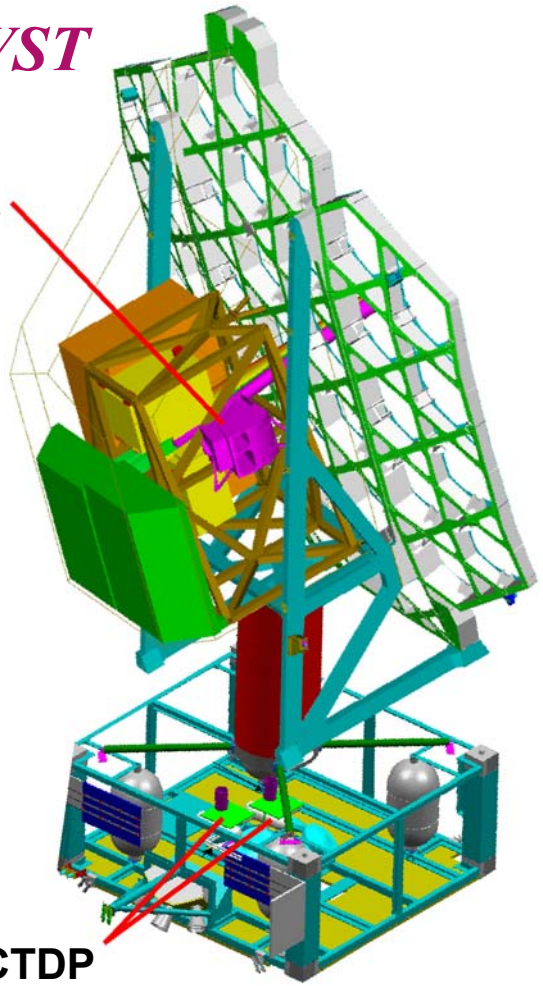
JWST



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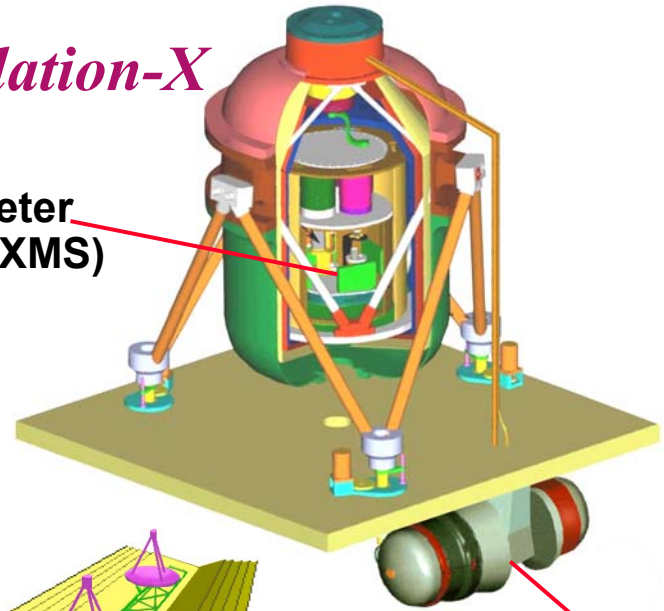

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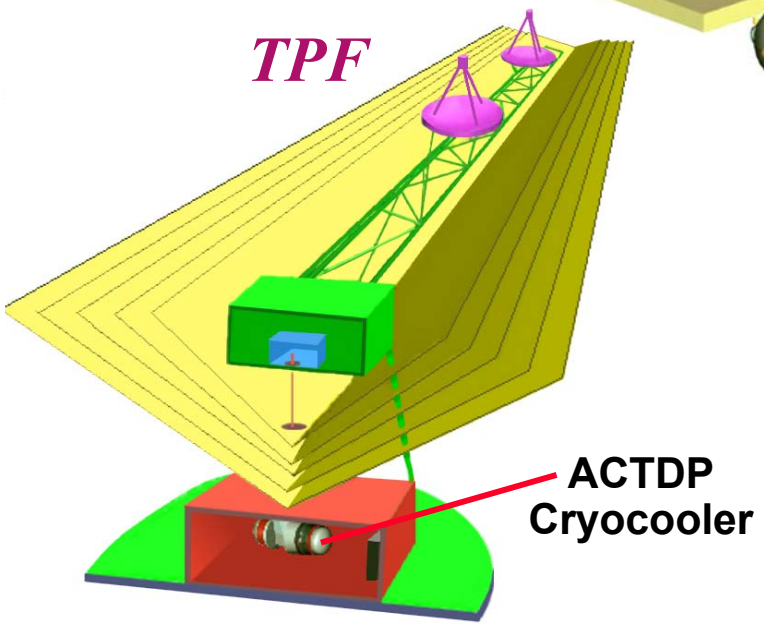

ACTDP Status

Terrestrial Planet Finder Mission

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- Of the many technologies proposed to the ACTDP, 3 have been selected as candidates for Engineering Model cooler development in 2003-2005
  - Hybrid Stirling / Joule-Thomson (Ball Aerospace, Boulder Colorado)
  - 4-Stage Pulse Tube (Lockheed Martin, Palo Alto, California)
  - Pulse Tube / Joule-Thomson (NGST (*TRW*), Redondo Beach, California)
- Detailed integration studies done in FY'03 for JWST/MIRI, Constellation-X, and TPF found ACTDP technical specifications, requirements, and cooler design concepts to be in excellent shape and well aligned
- All three cooler concepts have now successfully passed delta-PDRs with solid technical designs, and are making very good progress on detailed design / risk reduction (development-test) activities
- Gaining user acceptance of new technology remains a challenge
  - JWST has baselined a cryostat rather than an ACTDP cooler

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ACTDP cryocoolers will open exciting new NASA science opportunities