NASA's Reduced Gravity Research Opportunities

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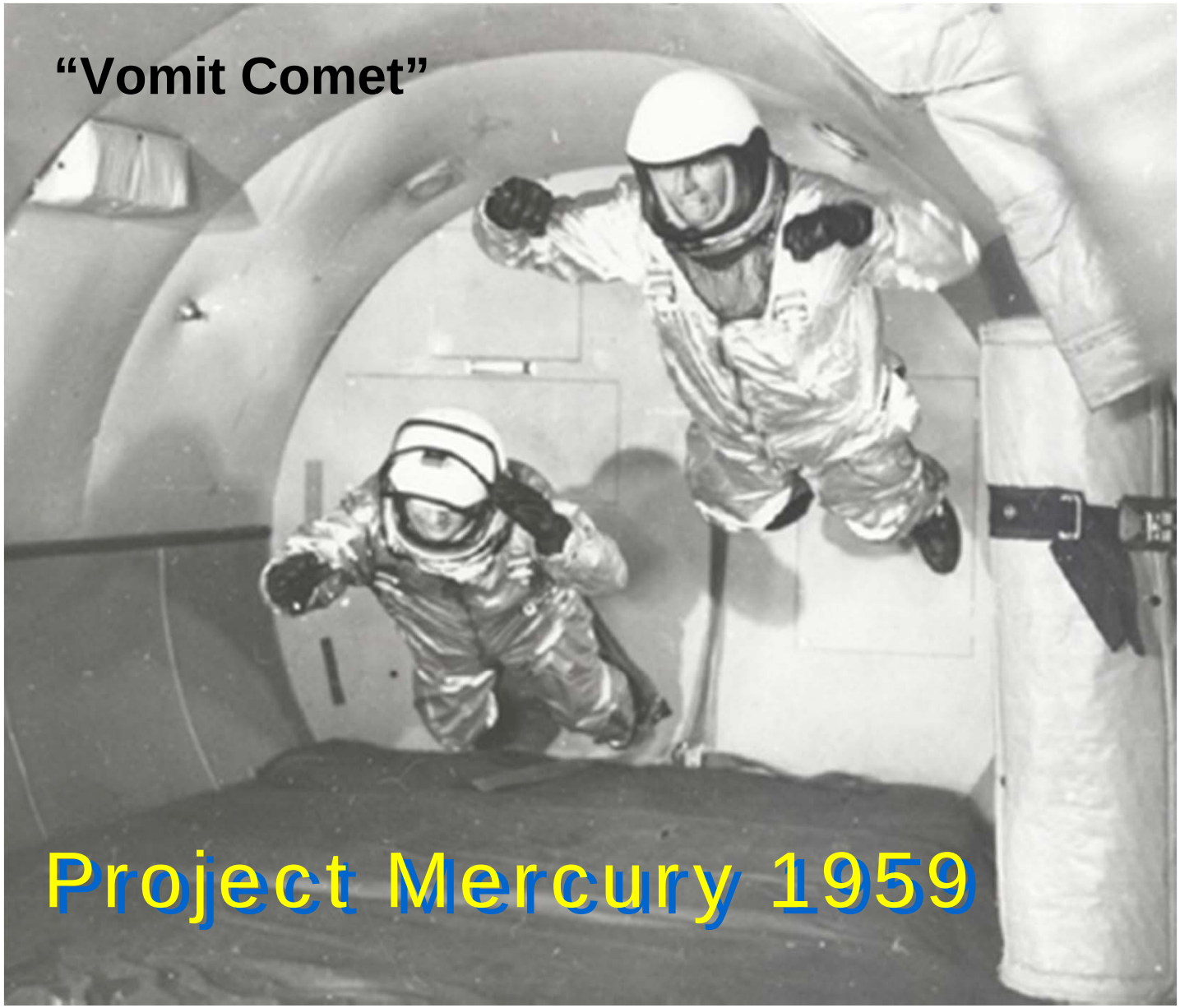

“Vomit Comet”
Project Mercury 1959

Typical NASA missions

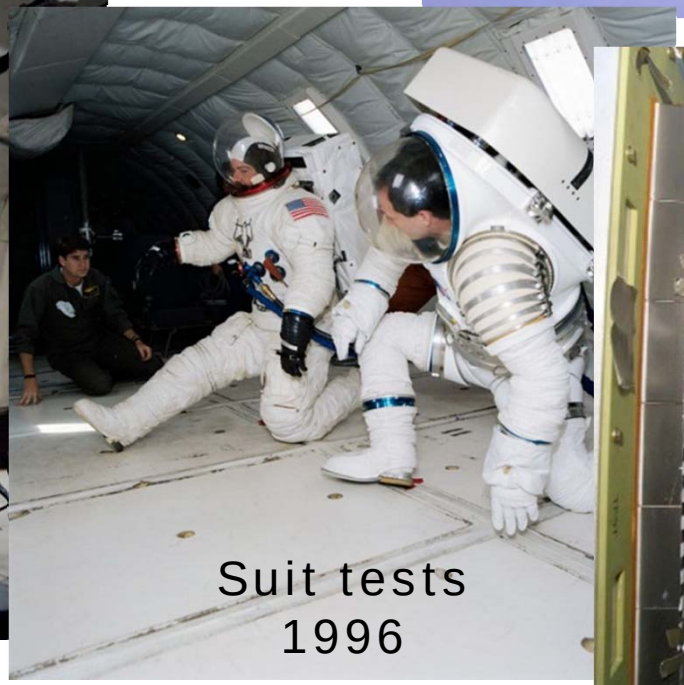
- 30 to 60 parabolas (typically 4 sets of 10), 4 flights/week
- Parabola types:
  - Microgravity: 17 sec @ 0.00 g +/- 0.05 g
  - Lunar: 20 sec @ 0.16 g +/- 0.05 g
  - Mars: 20 sec @ 0.38 g +/- 0.05 g


Apollo Crew Lunar Parabolic Flights


Partial Gravity Simulator (POGO)

KC-135

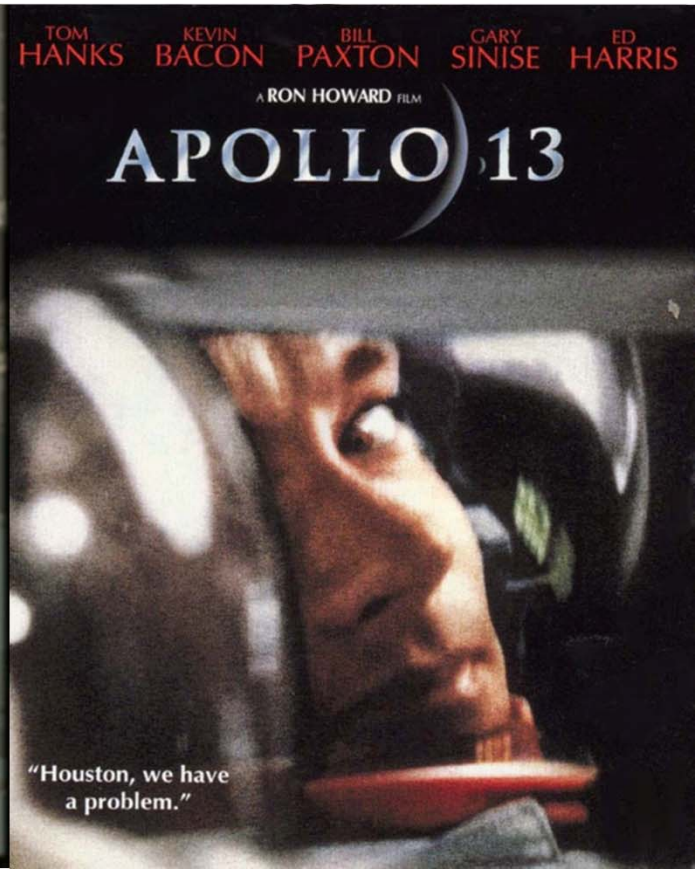
- Boeing 707
- 1973 – 2004 (two aircraft)
- Averaged 3,800 parabolas and 300 flight hours per year
- “Weightless Wonder”



KC-135 “static chair”

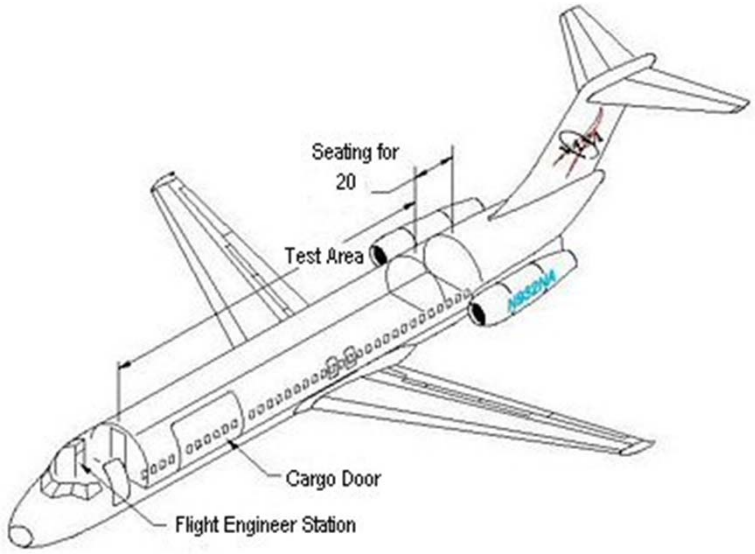
Estimated 285 gallons of vomit!

Parabolas for Film Making



C-9B

- McDonnell-Douglas DC-9
- 2005 - 2008
- Crew: Pilot, Copilot, Flight Engineer, 2 Test Directors, Flight Surgeon, Video person, Photographer
- Cabin smaller (2.0m H x 3.1m W) than KC-135 (2.4m H x 3.6 m W)



Zero G

- G-Force One (Boeing 727)
- 2008-2013 NASA contract at ~$5M/yr
- www.gozerog.com
- Interior contains 38 seats for researchers

Education Flight Opportunities

- **Microgravity University (UGrad)**

  Student teams propose, design, fabricate, fly and evaluate a reduced gravity experiment of their choice over the course of four to six months

- **Systems Engineering Education Discovery (SEED)**

  Student teams work with NASA PI to carry out scientific research, hands-on investigational design, test operations and educational/public outreach activities

Parabolic Vibrotactile Experiment

NASA Flight Opportunities

- **Maturing technology?**

Announcement of Flight Opportunities provides parabolic flights at no cost for technology development

- **Doing science?**

Science research facilitated through the NASA Research Announcements

General observations

- Parabolic flight provides ability to measure acute changes in microgravity that is not practical with orbital flight!
- Parabolic flight will likely be critical for preparing people and payloads for commercial spaceflight (e.g., Virgin Galactic)
- Constant transitions between g levels can be used to good advantage in many cases

Can you name the panelist?