

# Gemini: EVA

INST 154

Apollo at 50

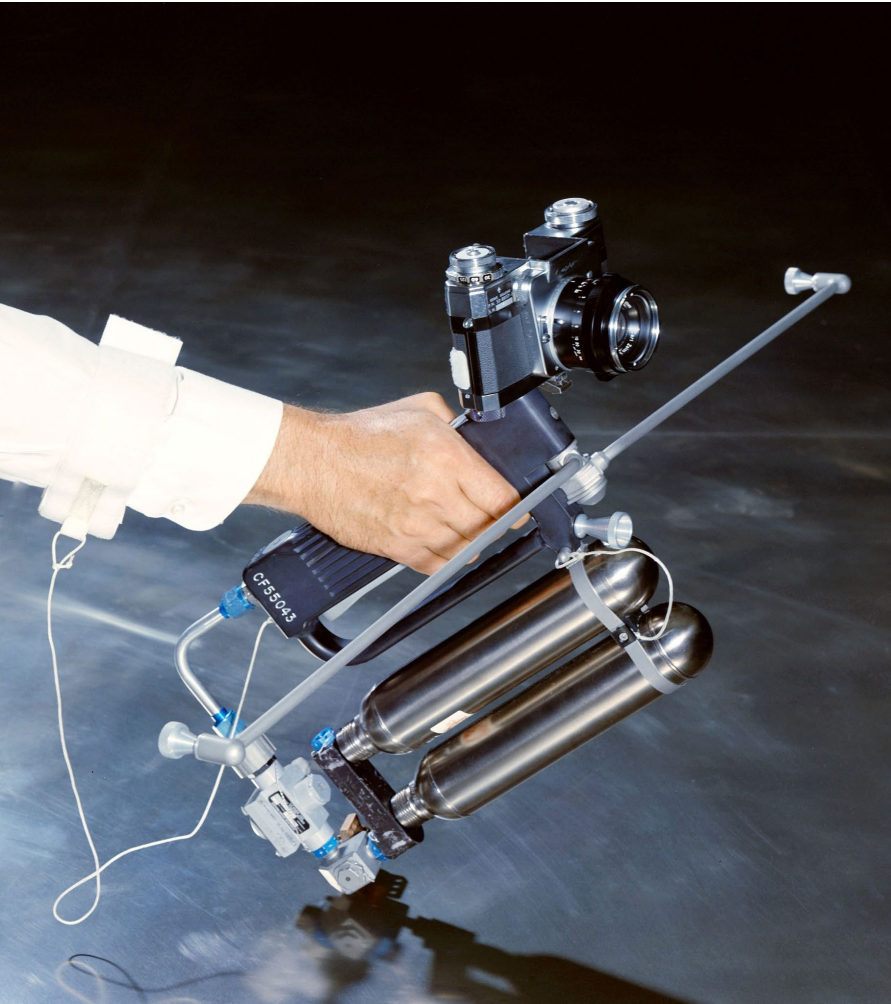
[Gemini XII](#)

# United States EVA Before Apollo 11

- Gemini 4 (36 minutes) Handheld maneuvering unit
- Gemini 9 (129 minutes) Backpack maneuvering unit **[EVA aborted]**
- Gemini 10 (39 minutes) Proximity operations **[EVA aborted]**
- Gemini 11 (38 minutes) Tethering two spacecraft **[EVA aborted]**
- Gemini 12 (129 minutes) Body restraint tests
- Apollo 9 (46 minutes) No umbilical



# Maneuvering Units



Gemini 4  
6 ft/sec

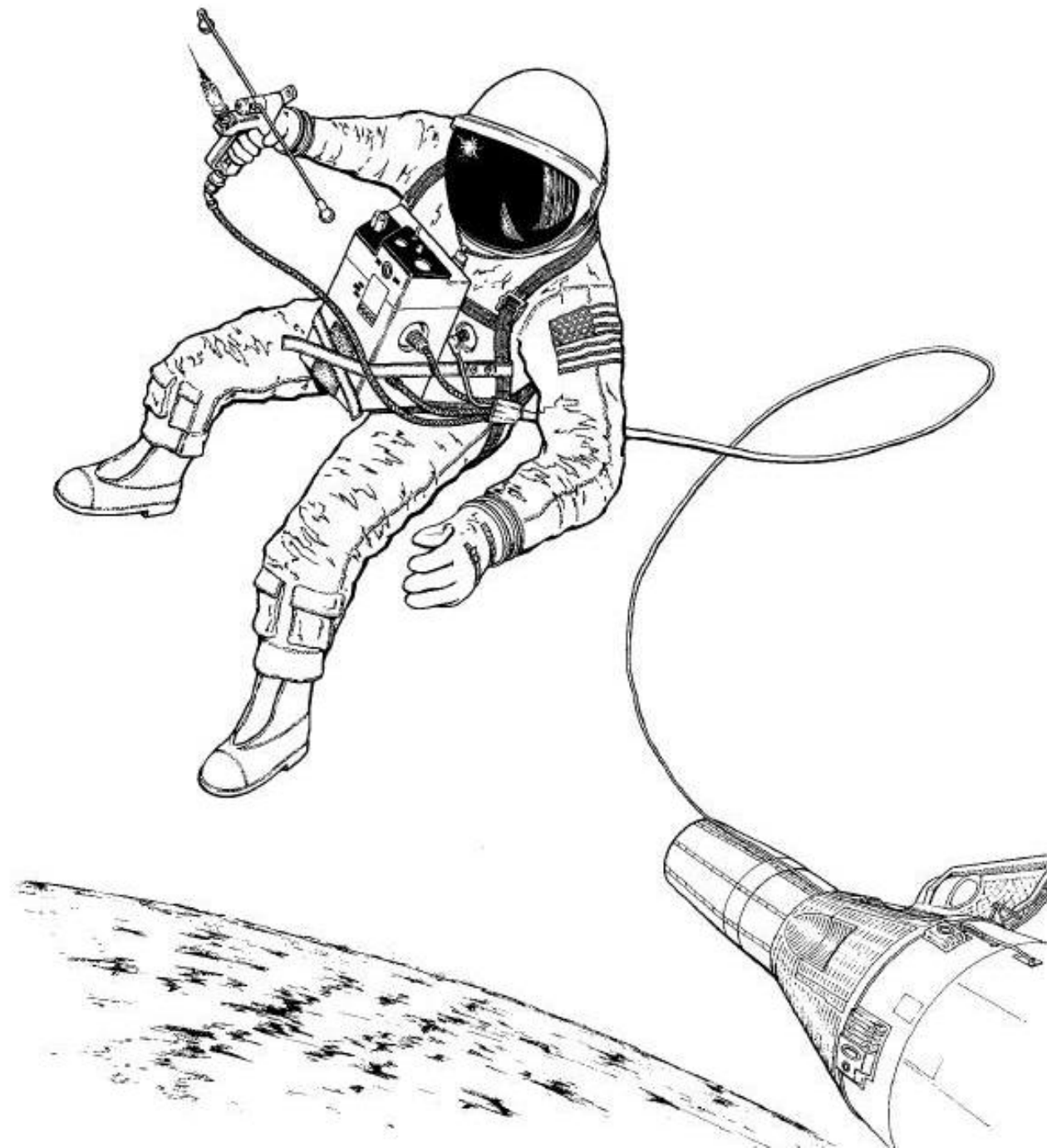


Gemini 9  
250 ft/sec



Gemini 10 and 11  
84 ft/sec

# Gemini 10/11 Handheld Maneuvering Unit

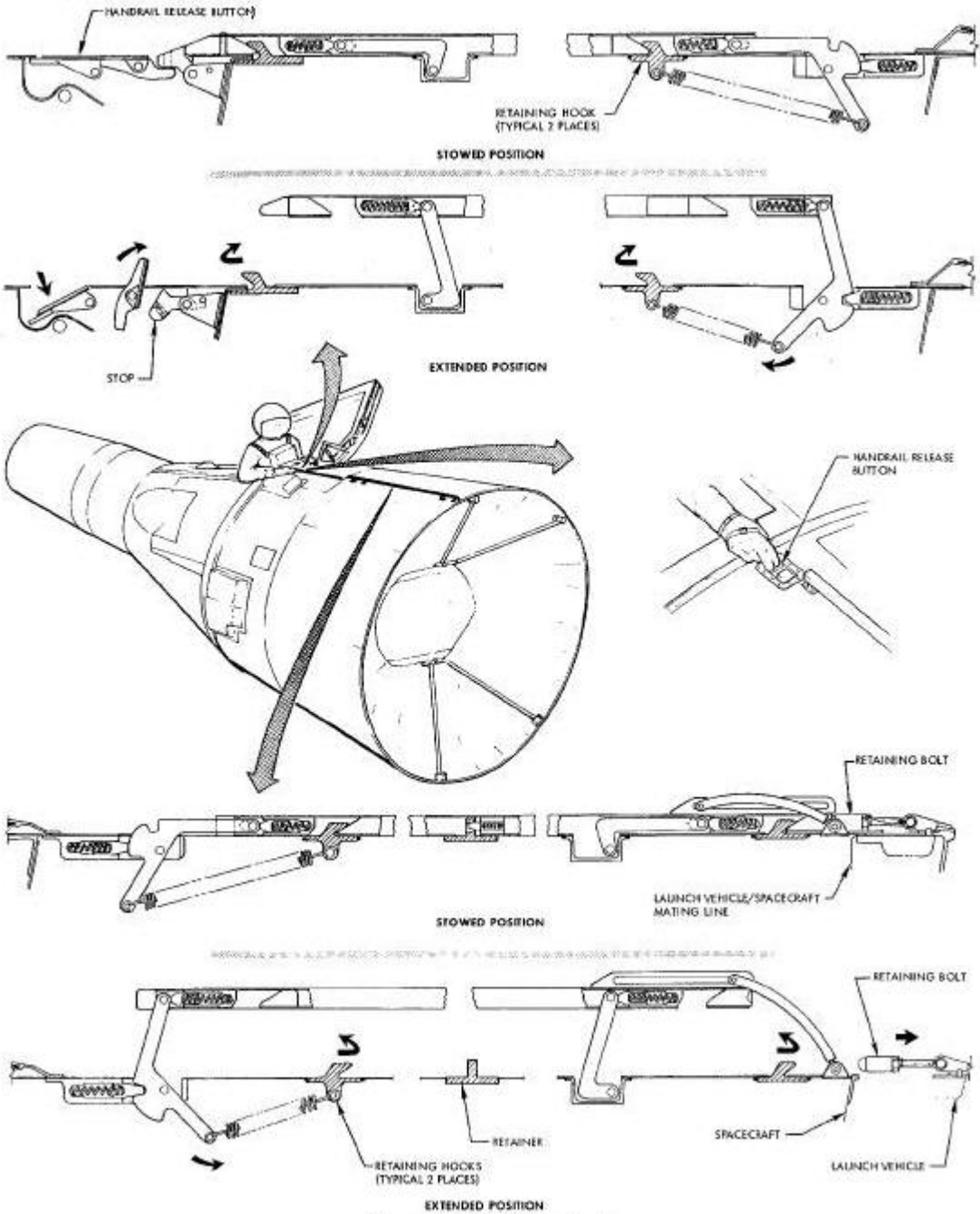


# Air-Bearing Floor EVA Trainer (Gemini 8)



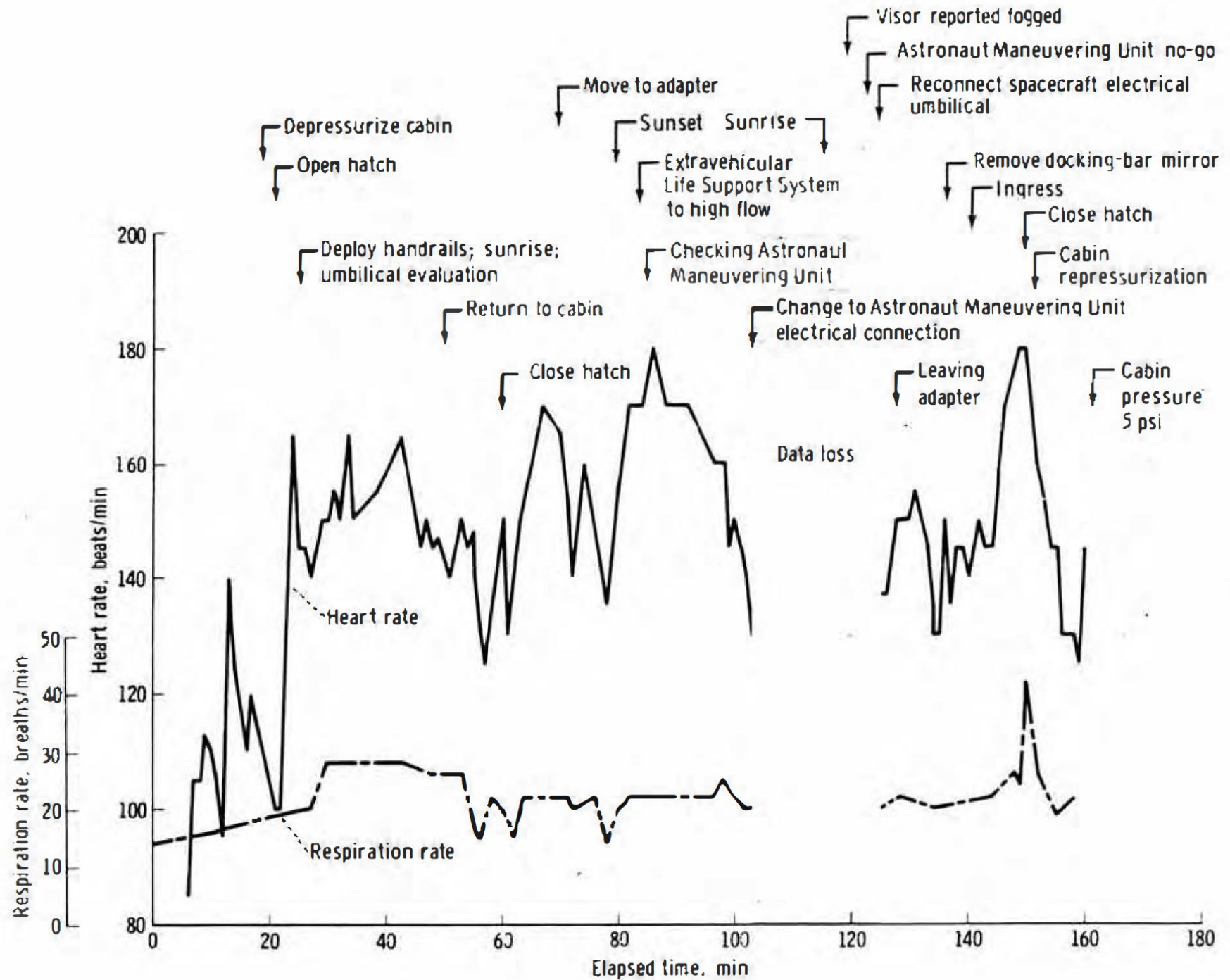


# Adapter Section Handrails





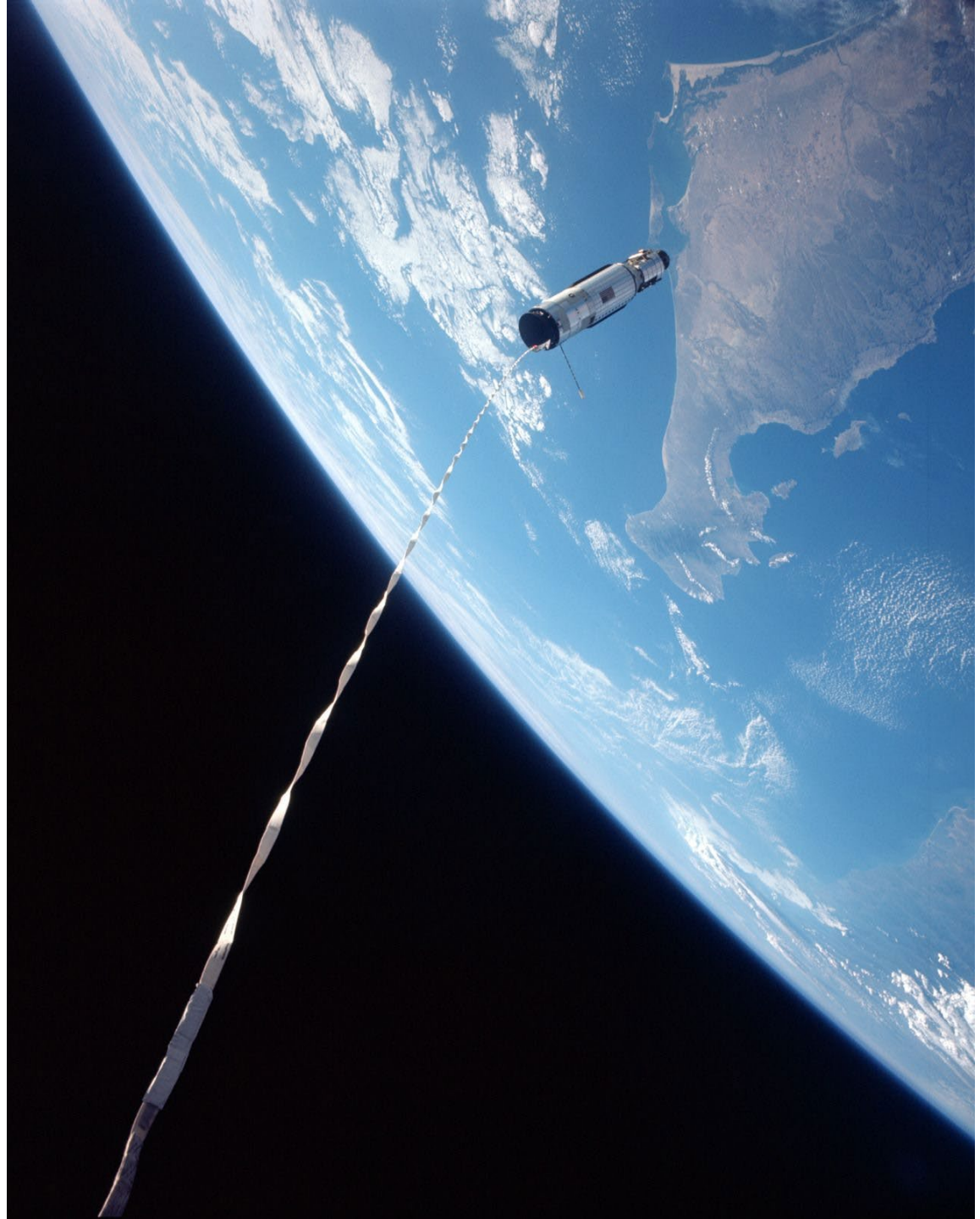
# Gemini 9

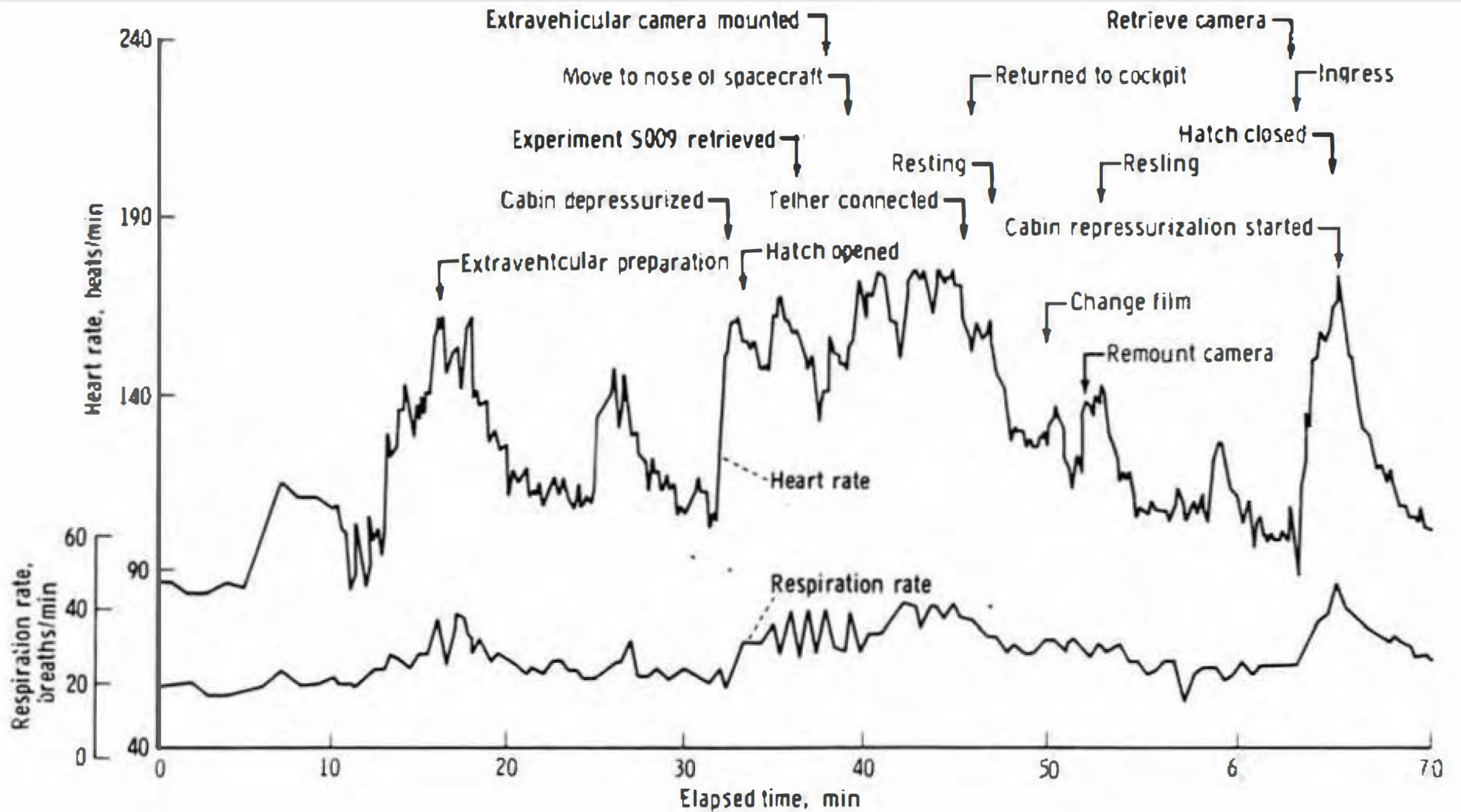




Beyond My Grasp  
series of two  
by James Dean

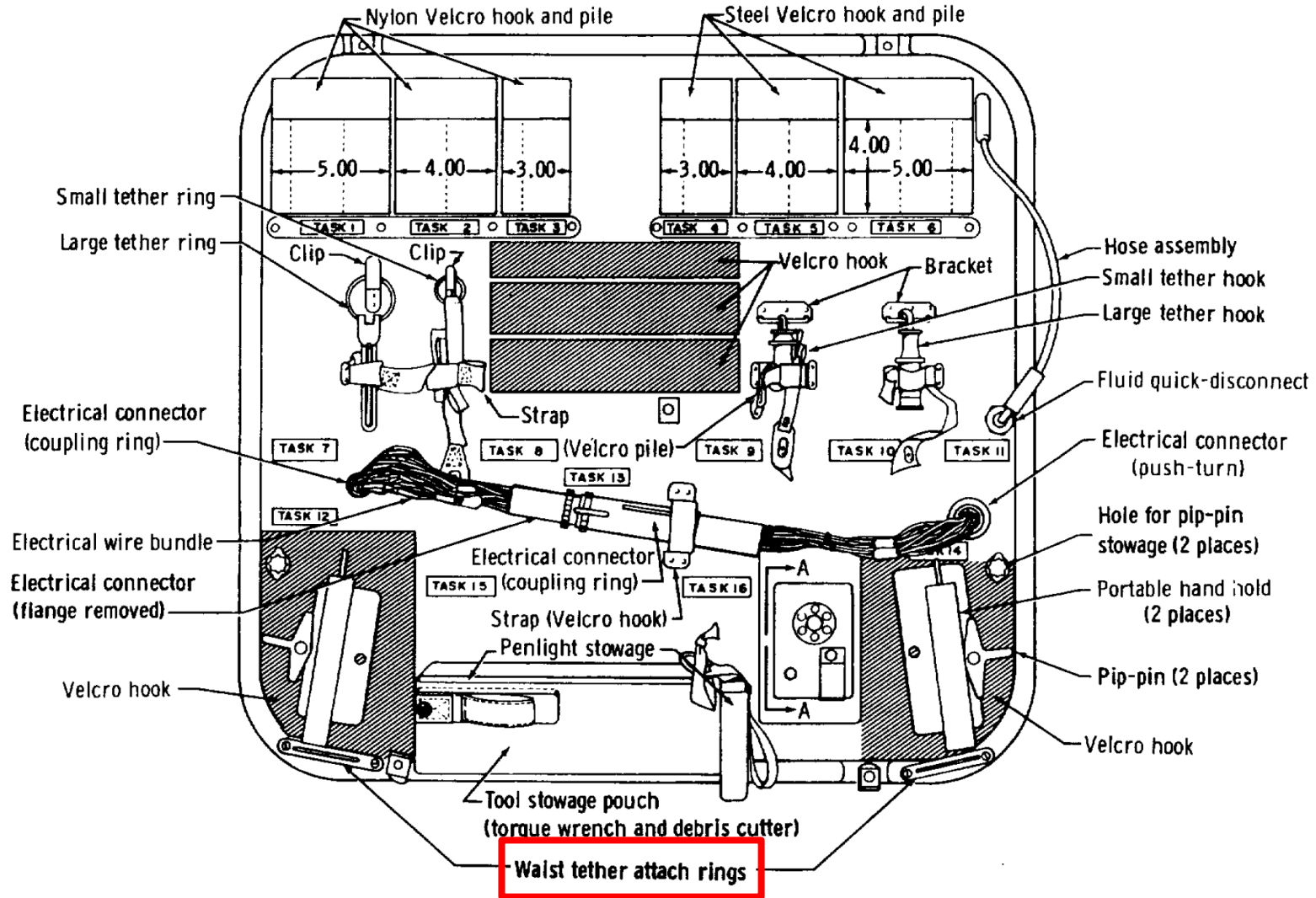
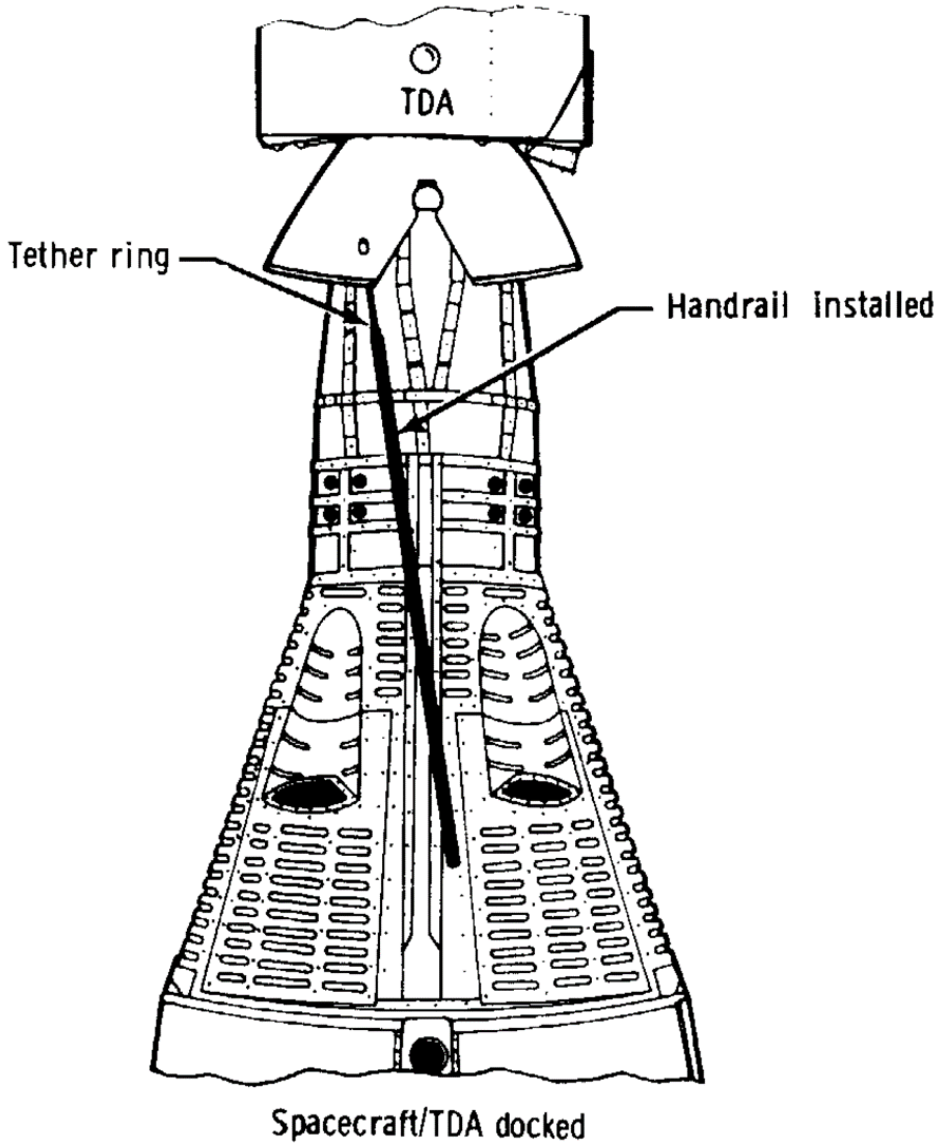
# Gemini 11 Tethered Stationkeeping





(c) Gemini XI pilot.

# Gemini 12 Body Position Aids



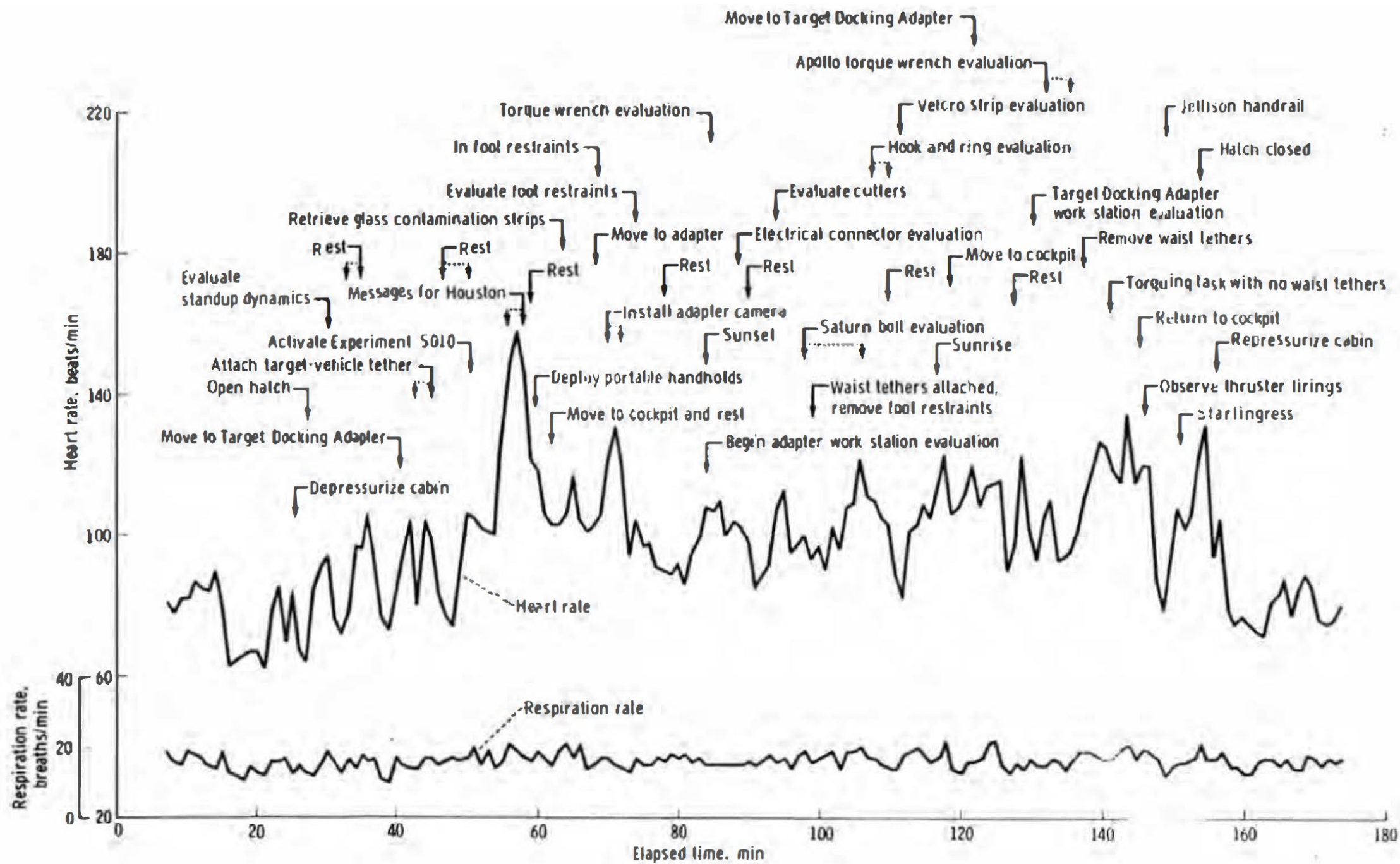
# Neutral Buoyancy Experimentation

- Boeing Bioastronautics [water]: 1963
  - Air Force X-20 DynaSoar
- Mattingly and Loats [air]: 1964
  - Langley MORL
  - Manned Spacecraft Center Gemini
- Marshall Space Flight Center[air]: 1964
  - Apollo Applications Wet Workshop
- General Electric [water]: 1964
  - Air Force MOL
  - MSFC Wet Workshop
- Convair [water]: 1964
  - Air Force MOL



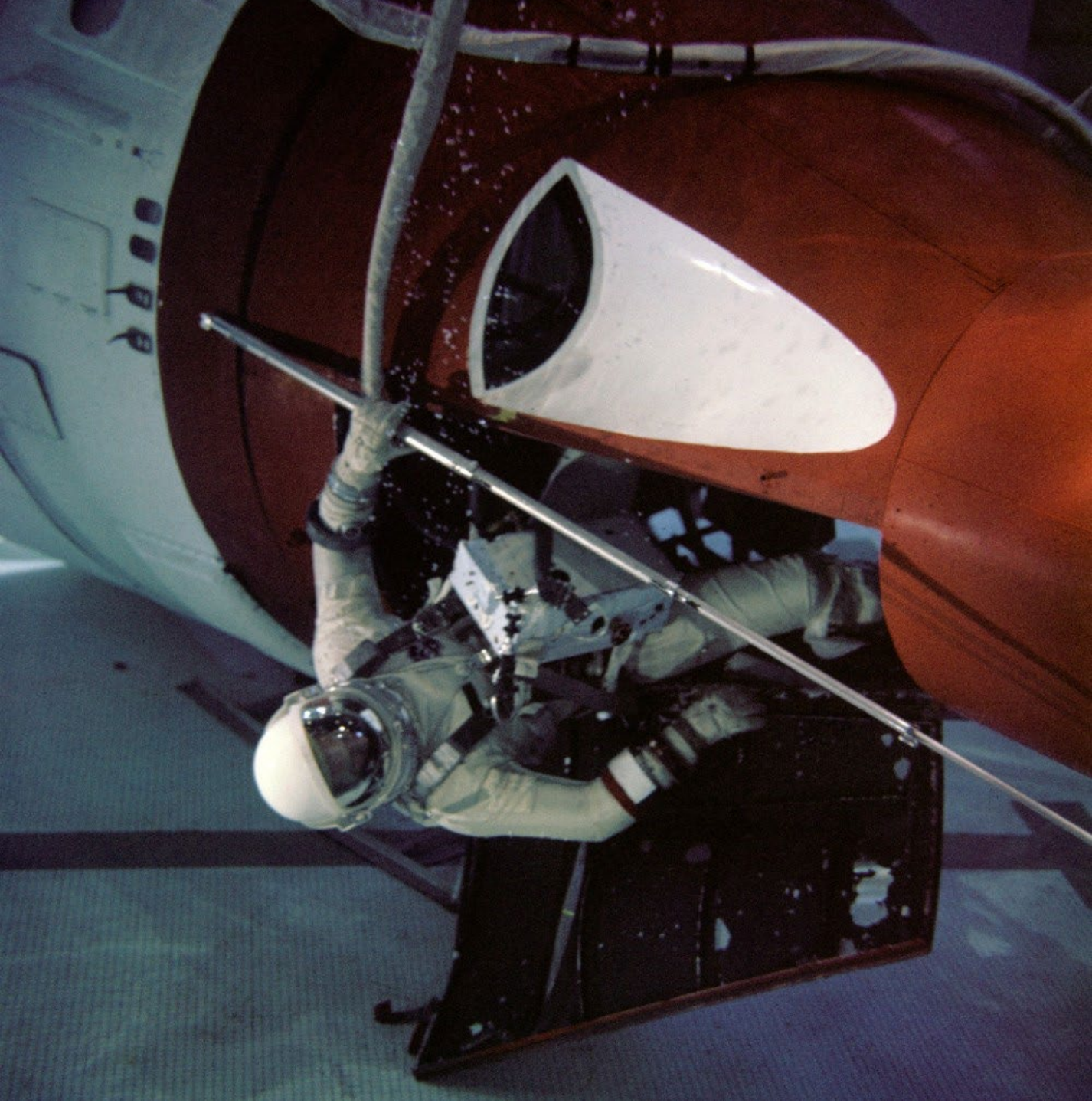
# Gemini Neutral Buoyancy Simulations (1966)

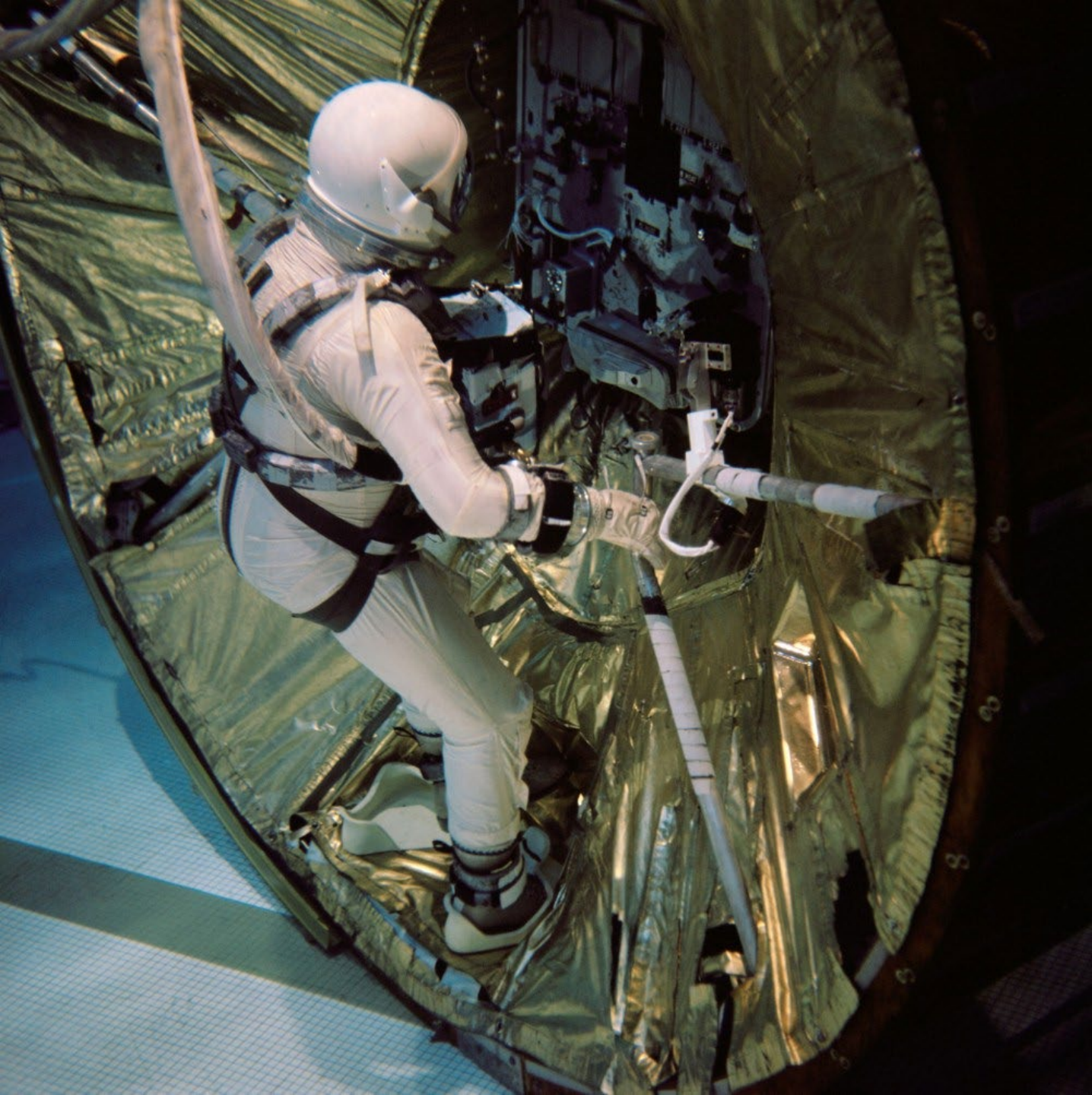
- June 3-6
    - June 15
  - June 30/July 1
    - July 18-21
    - July 25
  - July 28/29
  - August 10
  - August 22
  - September 11-12
    - September 12-15
  - September 14
  - October 16-17, 29
    - November 11-15
  - December 1
- Gemini 9A  
Wet Workshop demo to Marshall and Houston
- Gemini 10 procedures development  
Gemini 10  
Gilruth letter directing neutral buoyancy training
- Gemini 9 postflight evaluation (Cernan)
- Gemini 11 procedures development
- Gemini 12 procedures development
- Gemini 12 training (Aldrin)
- Gemini 11
- Gemini 12 procedures development
- Gemini 12 training (Aldrin)
- Gemini 12: November 11-15
- Gemini 12 postflight evaluation (Aldrin)



(c) Gemini XII pilot.







# Gemini Accomplishments

## Specific Objectives

- Long duration flight
- Rendezvous
- Docking
- EVA
- Precision landing
- Tethered stationkeeping

## Other Benefits

- Flight experience
- Mission operations experience
- Training experience
- Launch operations experience
- Responsive planning experience
- Hardware maturation

# Discussion Groups

- **Portree (“Spacewalks that Never Were: The Gemini EVA Planning Group”)**
  - **The original plans for Gemini EVA – no plan survives first contact with reality!**
- Neufeld (“Practicing for Space Underwater: Inventing Neutral Buoyancy Training”)
  - A nicely nuanced treatment of the development of the invention of underwater training
- Gemini 12 Mission video
  - An excellent documentary on the Gemini XII underwater training and the mission

# Online Sessions

- Schedule:
  - No classes on Tuesday March 24 or Thursday March 26
  - Online Classes March 31 and April 2, 7, 9
  - Then whatever the university decides after that (face to face or online)
- Assignments are all still due at 5 PM!
  - Team project and draft term paper are each moved 1 week later
  - Term paper is moved 1 day later
- While online:
  - All materials will be available 1 week early
  - Office hours will be at same times, by videoconference
  - Read email every day
  - Open book quiz every class on ELMS, due by 6:15
  - Discussion boards (by table): all students contribute for every session, due by 6:15 PM
- If we are still online on Tuesday May 12, that one class will be synchronous