Technical Challenges in Providing Ophthalmic Telemedicine for Ocular Monitoring during Long-Duration Spaceflight

Michael Caputo, MS — Washington University School of Medicine
C. Robert Gibson, OD — Coastal Eye Associates/Wyle Integ Sci & Eng
Anastas Pass, OD, MS, JD — University of Houston
Thomas Mader, MD — Alaska Native Medical Center

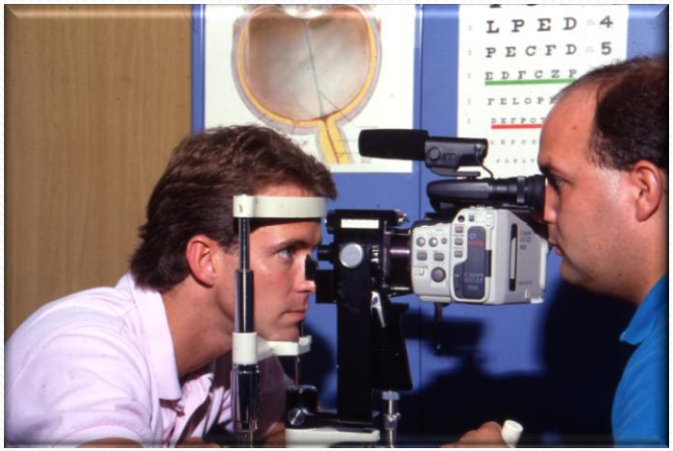
Acknowledgements & Funding

- The following individuals contributed to the procedures, training, and on-orbit operations of the Panoptic Project
  - Ashot Sargsyan, MD (Wyle)
  - Melinda Hailey, RN (Wyle)
  - Julia Ann Wells, RN (Wyle)

- This project was funded through theWyle Bioastronautics and OMOH contracts at NASA/Johnson Space Center (Houston, TX)

Ocular Health Monitoring on Space Shuttle

- 1989 – 1994 Retinal Photography (DSO 474)
  - Kowa RC-2 Handheld Funduscamera
  - Integrated with inflight video system for telemedicine downlink
  - Required dilation
  - Short duration missions (< 14 days)

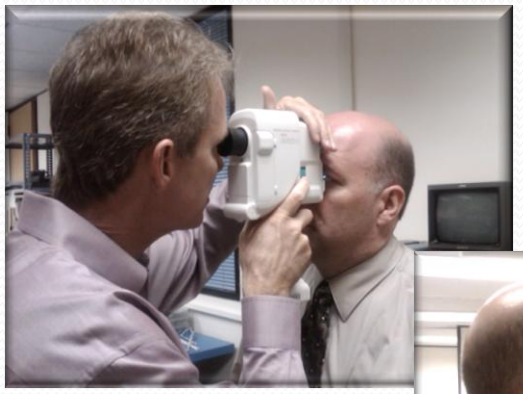


International Space Station

- Long-Duration (Approximately 6 months)
- Need to monitor Ocular Health
- Telemedicine capability - *highly desirable*
- Challenges
  - Mass, Power, Volume
  - Limited crew training for this capability
  - Limited impact on crewmembers (i.e. Non-mydriatic)

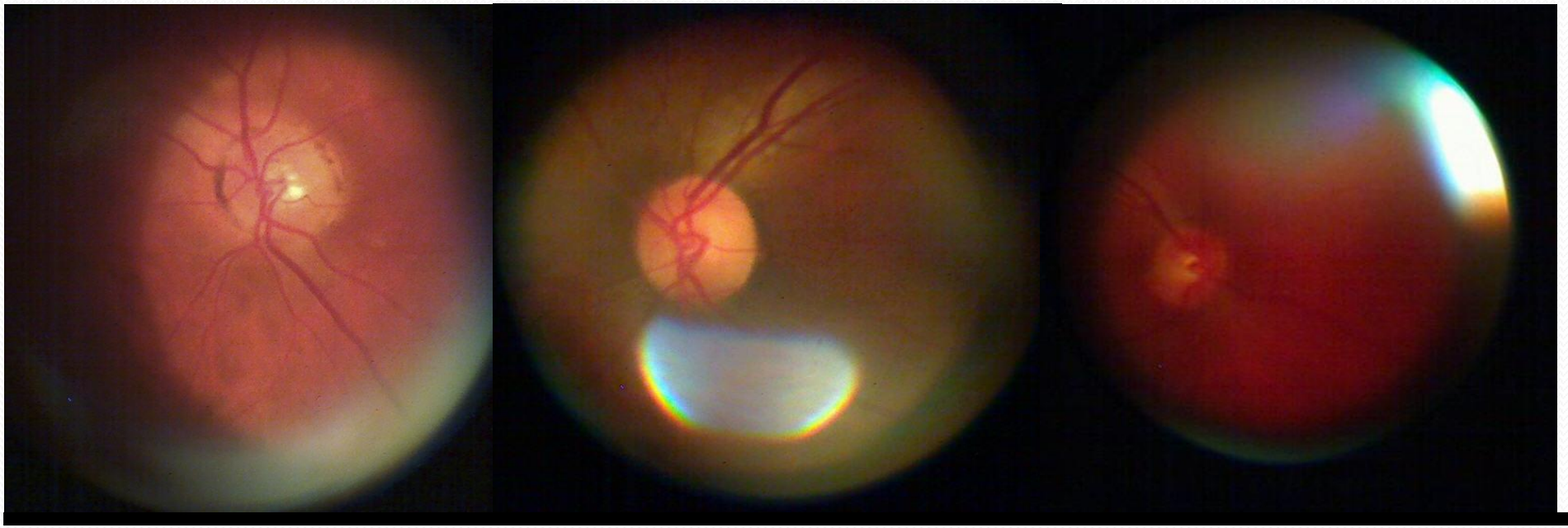
Hardware Options

- DSO 474 Hardware
  - No longer in the flight hardware inventory
  - Both fundus and video cameras are out of production
- Conventional Ophthalmic Devices
  - Designed for clinics
    - Too large for space flight
    - Mass, Power, Volume
  - Handheld devices
    - Kowa Genesis D
    - Welch Allyn PanOptic




esa

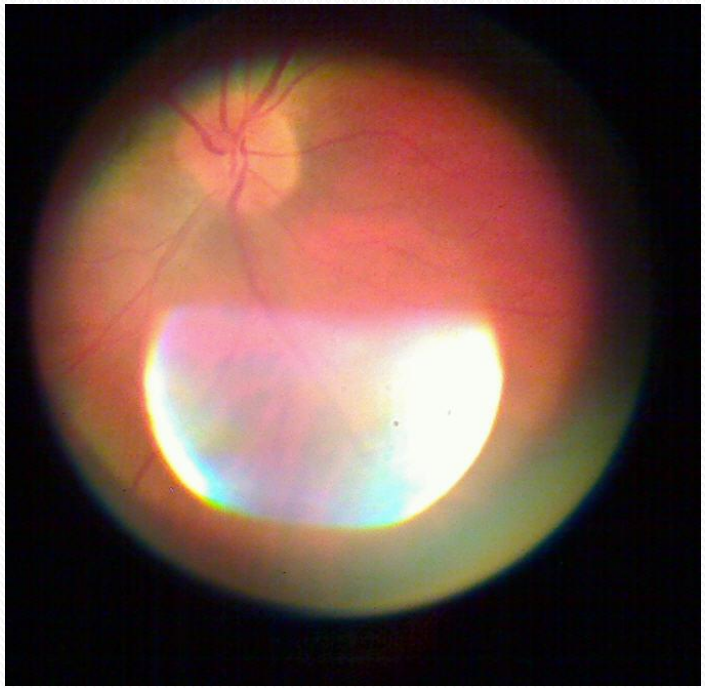
Inflight Images



Lessons Learned

32 Telemedicine sessions using Provizion PanOptic system

- Advantages
  - Simple Design
  - Non-mydriatic
  - Off the shelf
- Limitations
  - Ease of Use
  - No viewing screen
  - Image Quality



Next Steps

- Improvements to current device
  - Improve image quality
    - Optical Coupling
    - New USB Camera
  - Improve ease of use
    - Add viewing screen
    - Additional crew training?
  - Evaluate alternate devices as they become available