Antenna System Status

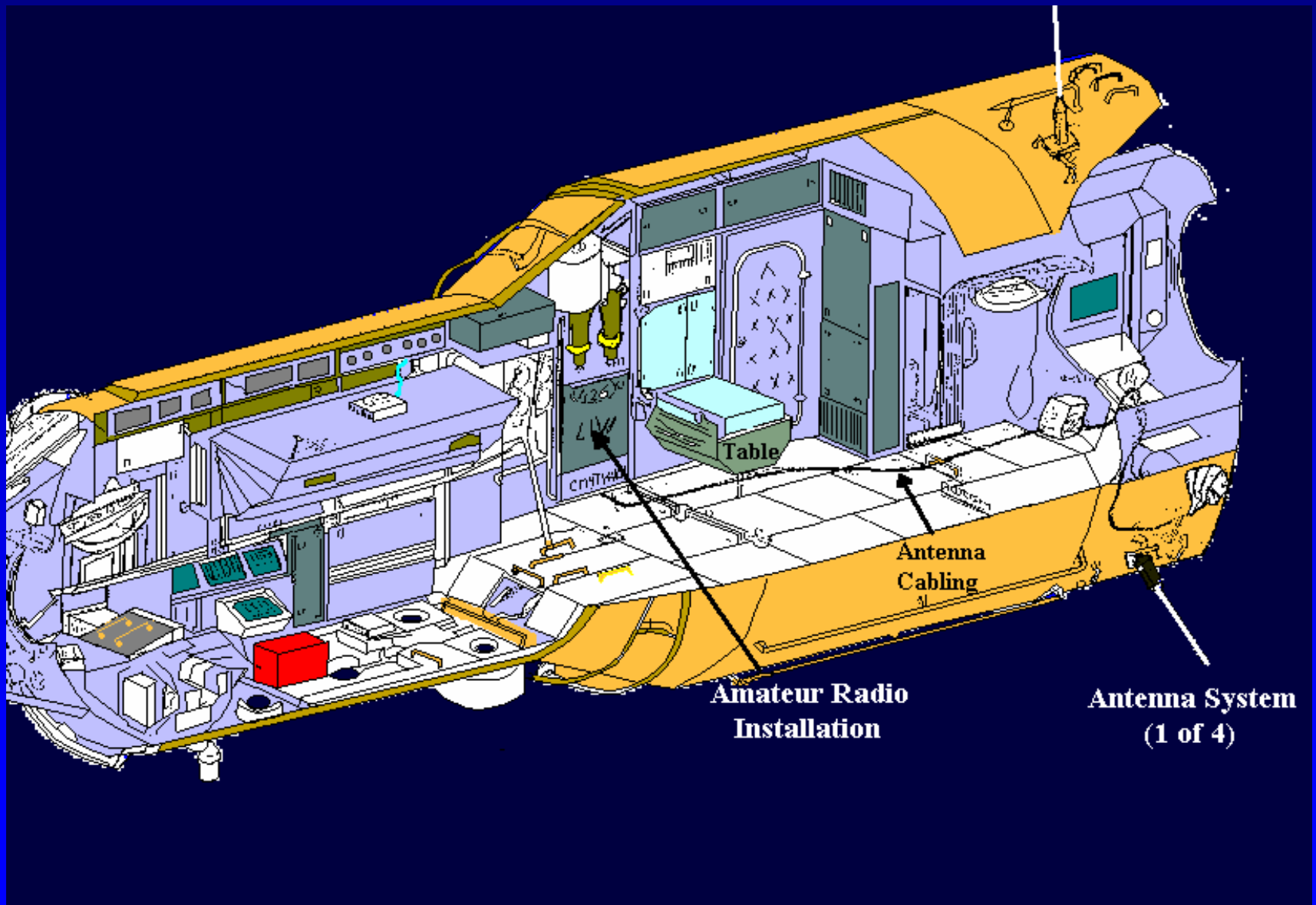
ARISS International Meeting

NASA GSFC

December 5, 2002

Frank H. Bauer, KA3HDO
Sergej Samburov, RV3DR

ARISS / ISS HAM
Location in and on the Service Module



ARISS Hardware Location in Service Module

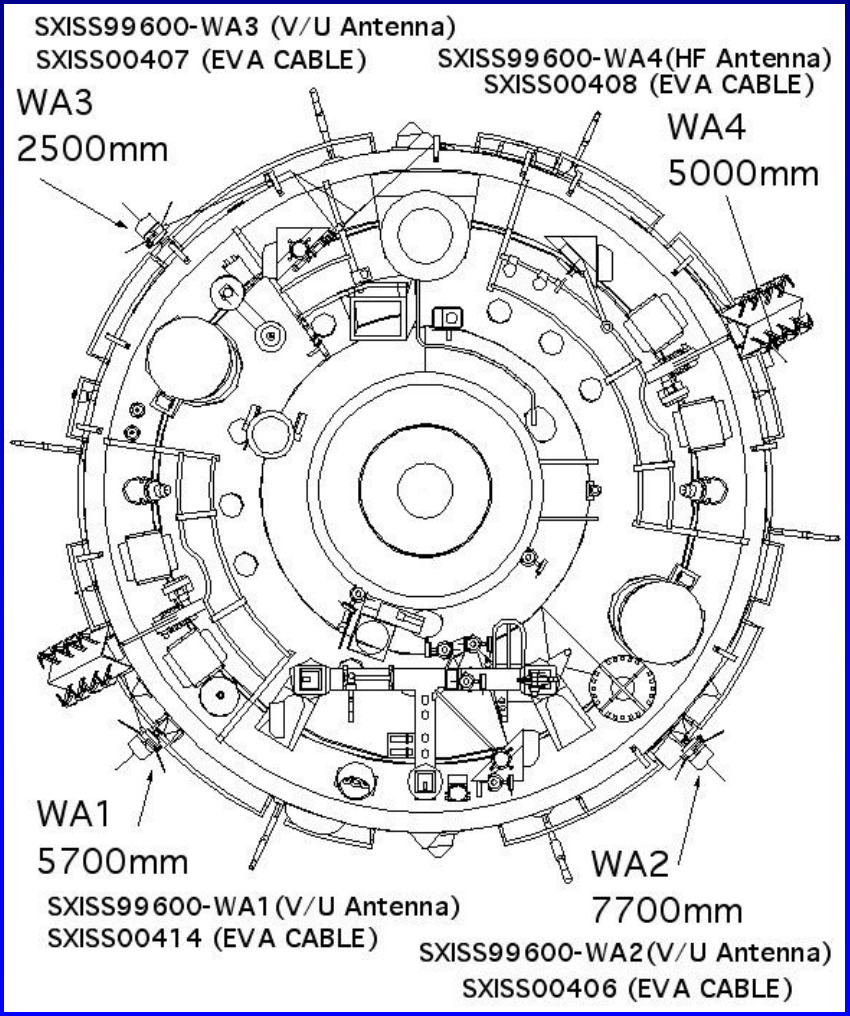
ARISS Team Members Sergej Samburov (Russia), Frank Bauer (US) & Alberto Zagni (Italy) (L to R) in front of ARISS Hardware Installation Area

Service Module Closeout Photos
Radio Station Location

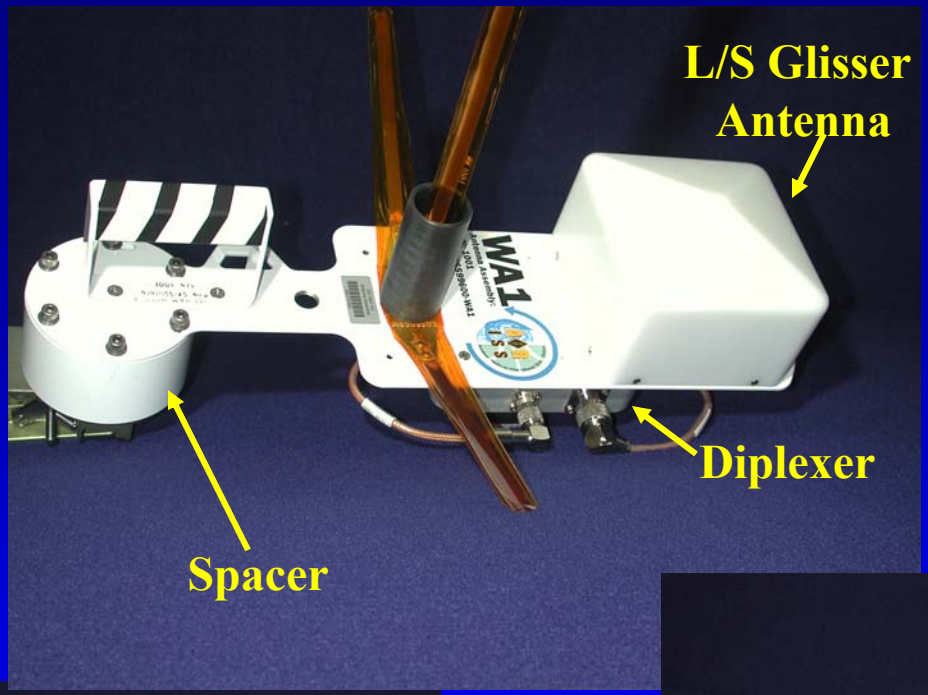
Internal Hardware
(New Item Introduced per Energia's Request)

ISS Ham RF Interface Cable

Antenna System Installation on Service Module



Antenna System w/ VHF/UHF Antenna Installed (1 of 4)

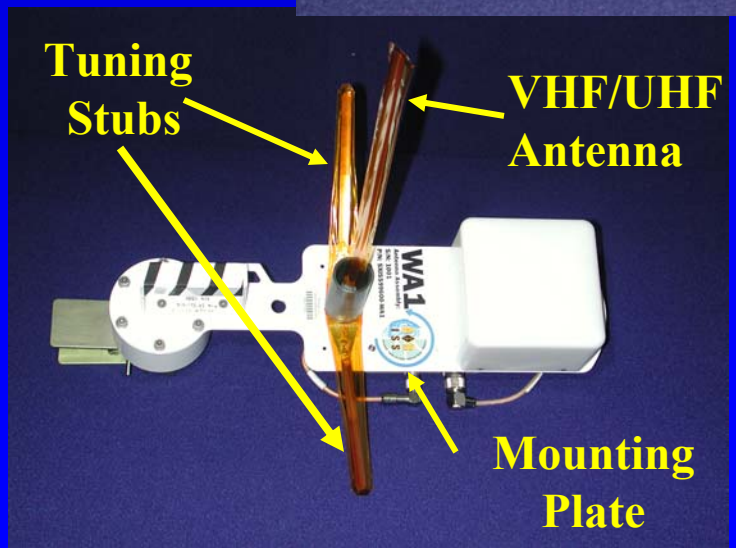


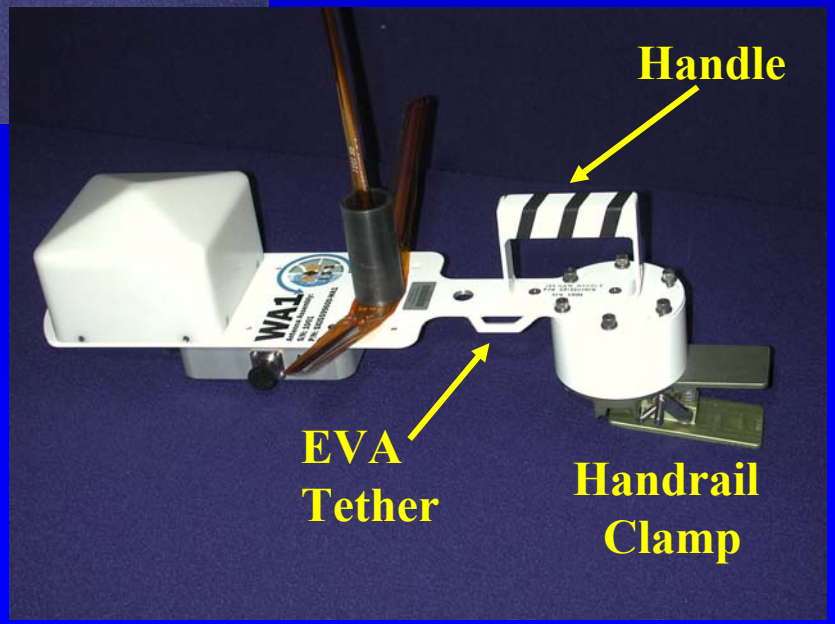
Internationally Developed

Italian Contribution:
- Microwave Antennas
- Diplexer

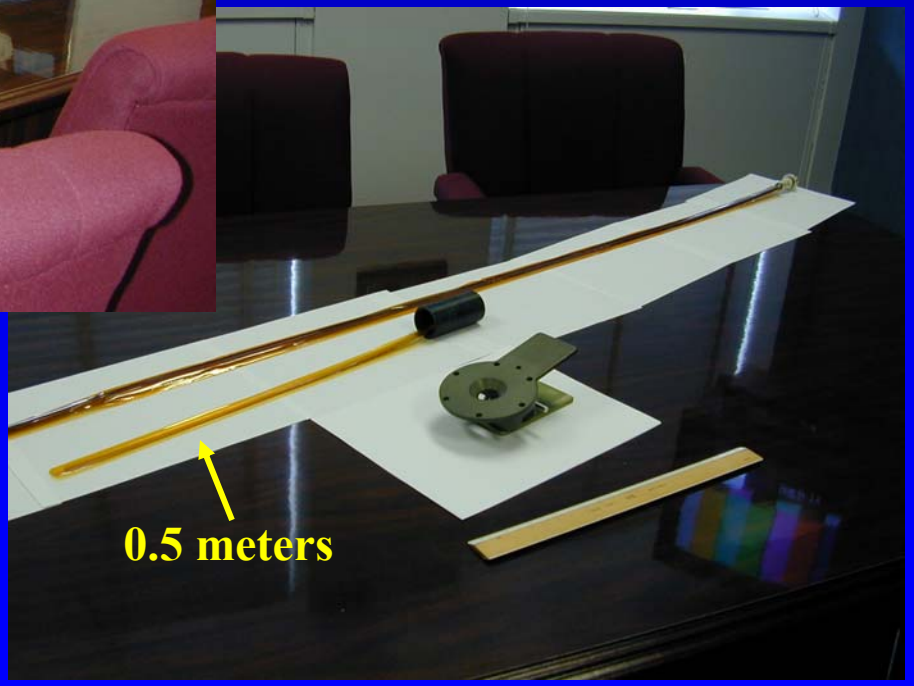
US Contribution:
- Mounting Plate
- Handle & Spacer
- VHF/UHF & HF Antennas

Russian Contribution:
- Handrail Clamp
- Interconnecting Cables

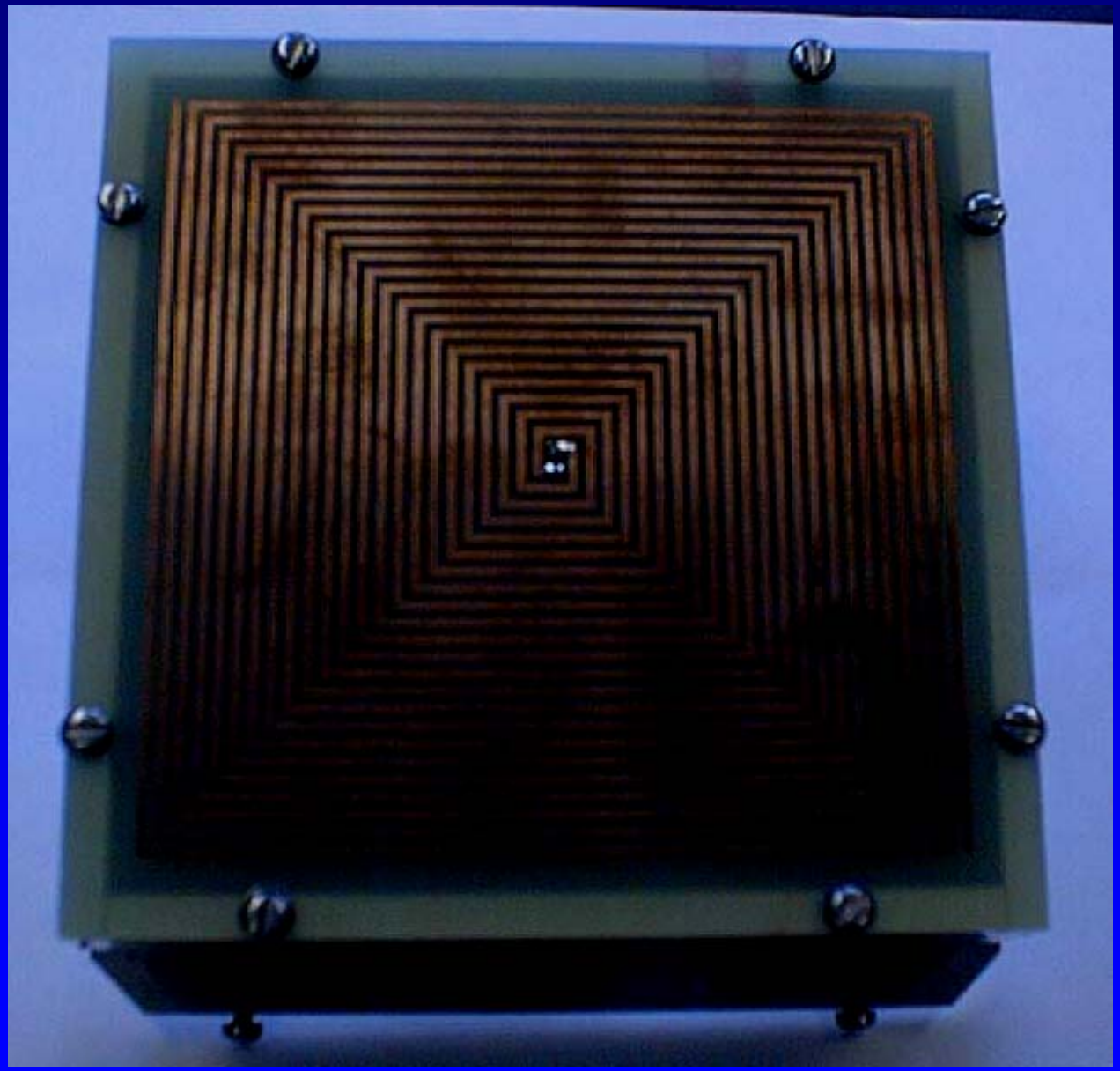


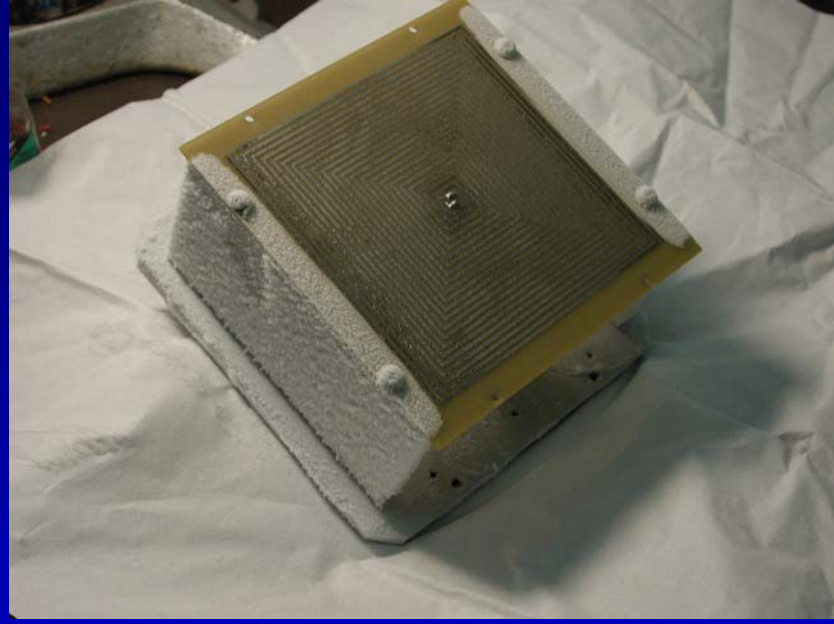


VHF/UHF & HF Antenna Systems

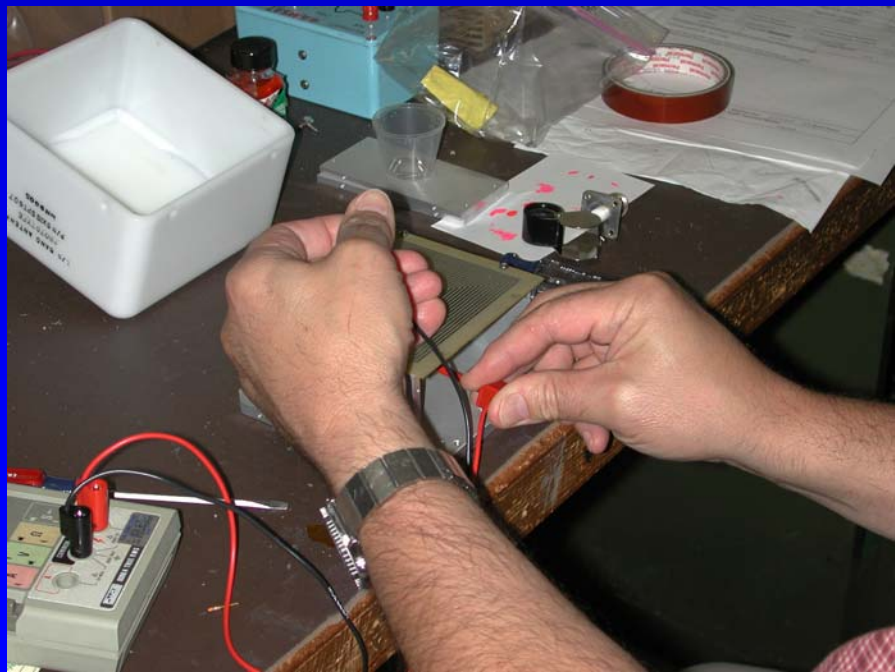


L/S Band Antenna Prototype



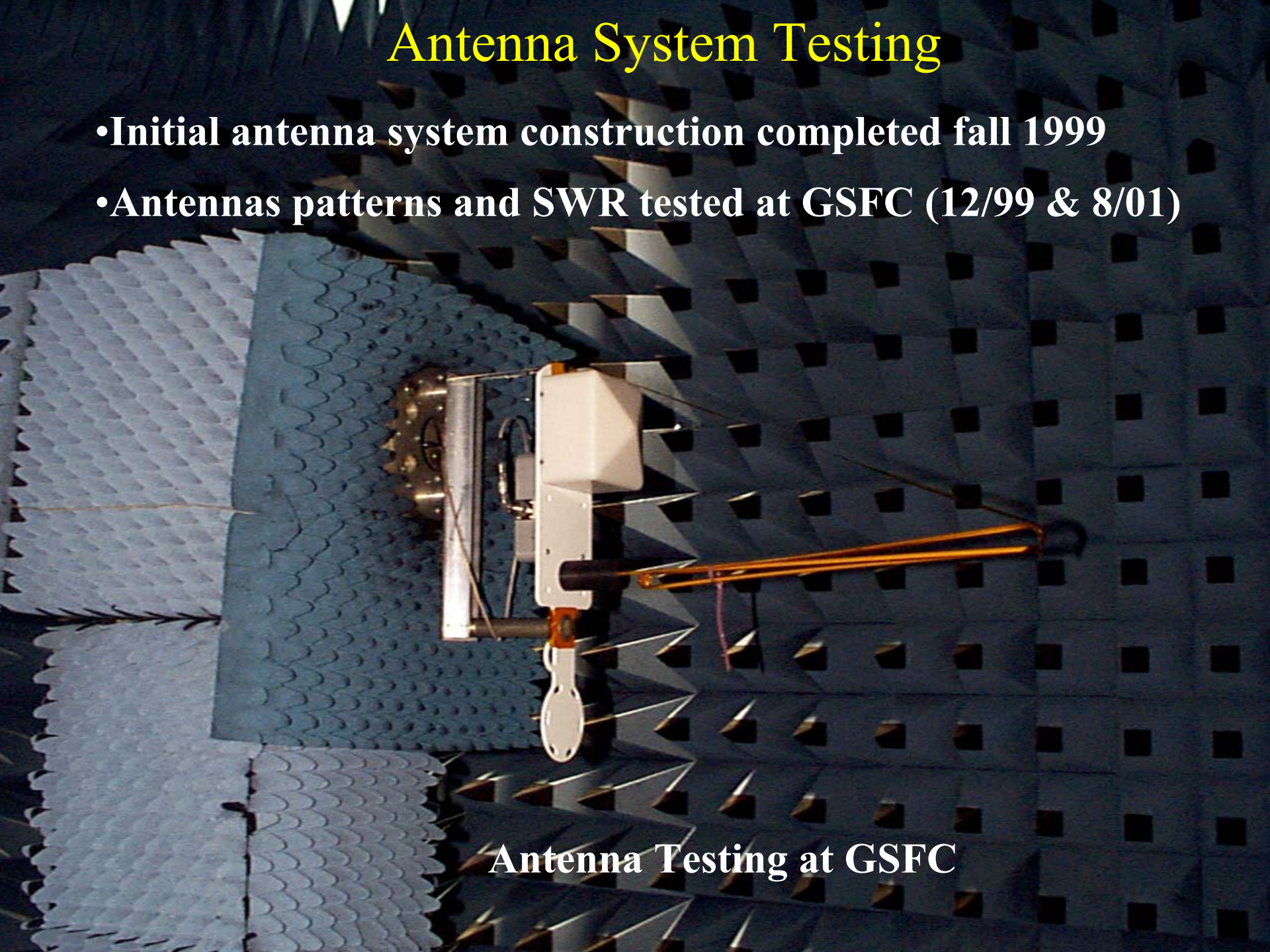


Antenna System Thermal Testing



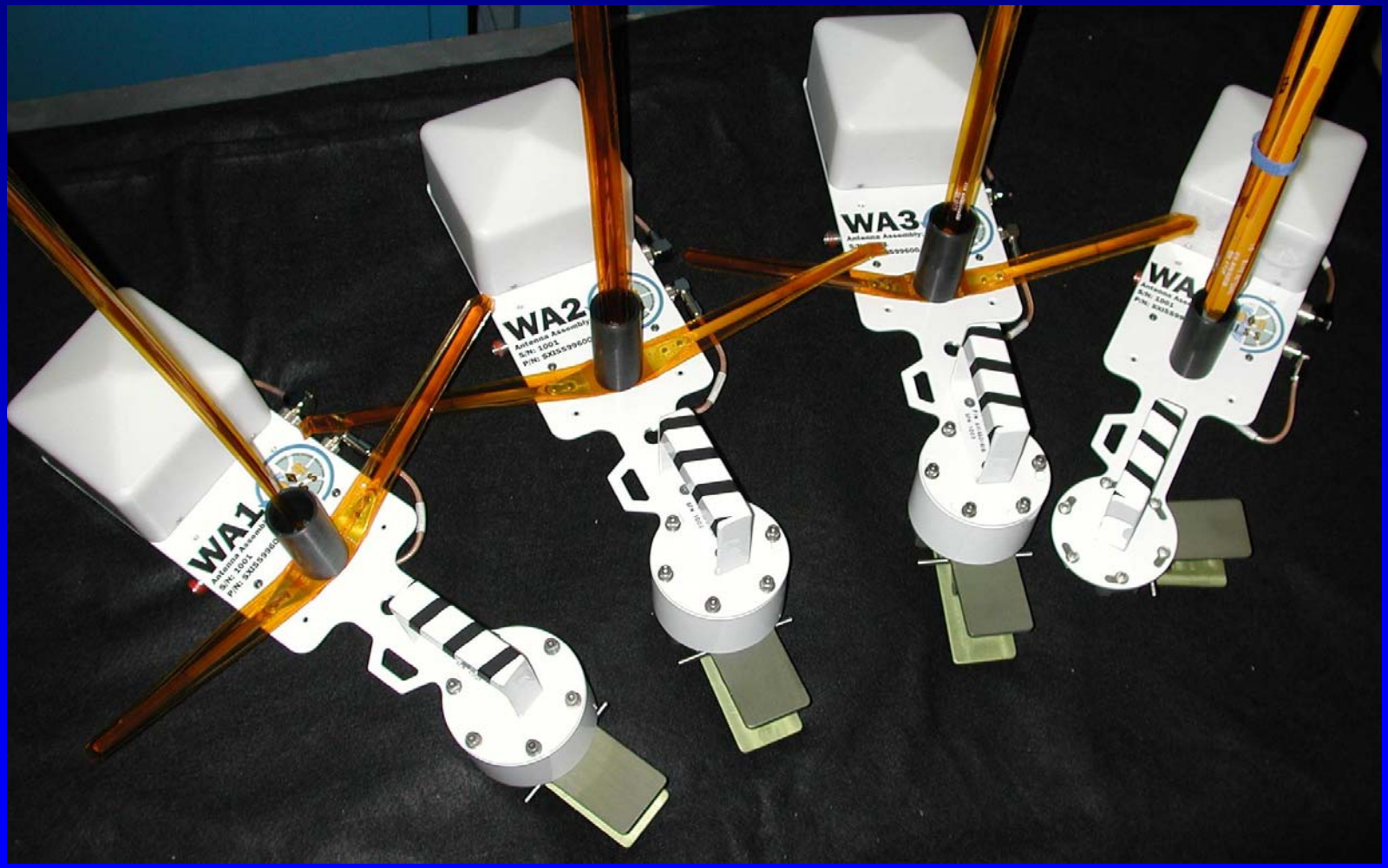
Antenna System Testing

- **Initial antenna system construction completed fall 1999**
- **Antennas patterns and SWR tested at GSFC (12/99 & 8/01)**



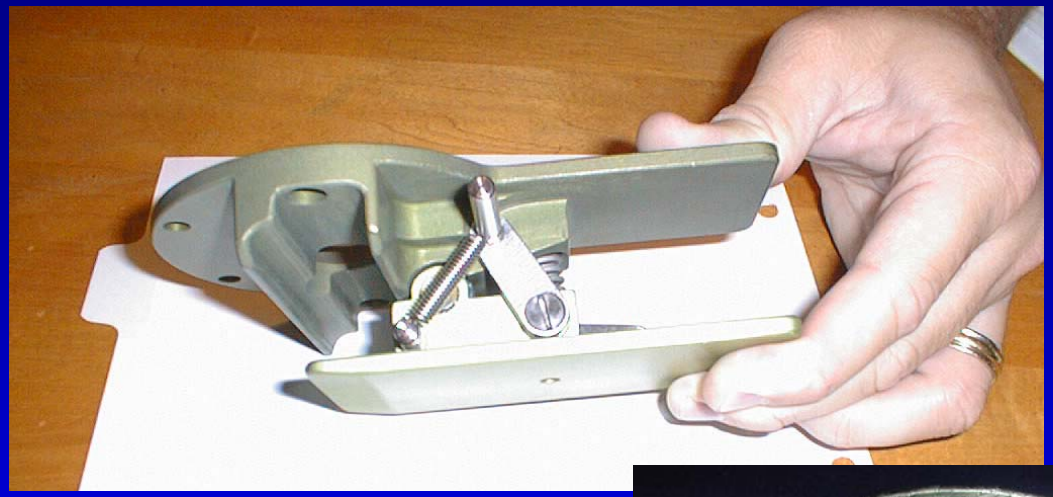
Antenna Testing at GSFC

Antenna Systems WA1-WA4



Russian Sub-components

Handrail Clamp



Power Connector
(Internal)

ISS Ham EVA Cable
(w/ EVA RF Interface
Connector Attached)

Russian Cable Clip

EVA Connector

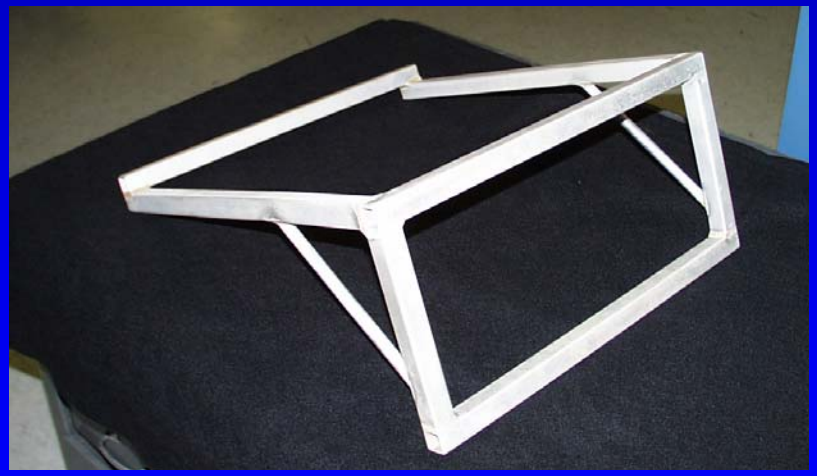
Service Module Closeout Photos
EVA Connectors

Antenna Handrail Closeout Photos

ISS Ham Antenna Frame

- Considered an EVA tool
- Certification and Acceptance Requirements Document (CARD)

Frame Mockup for Hydrolab Training

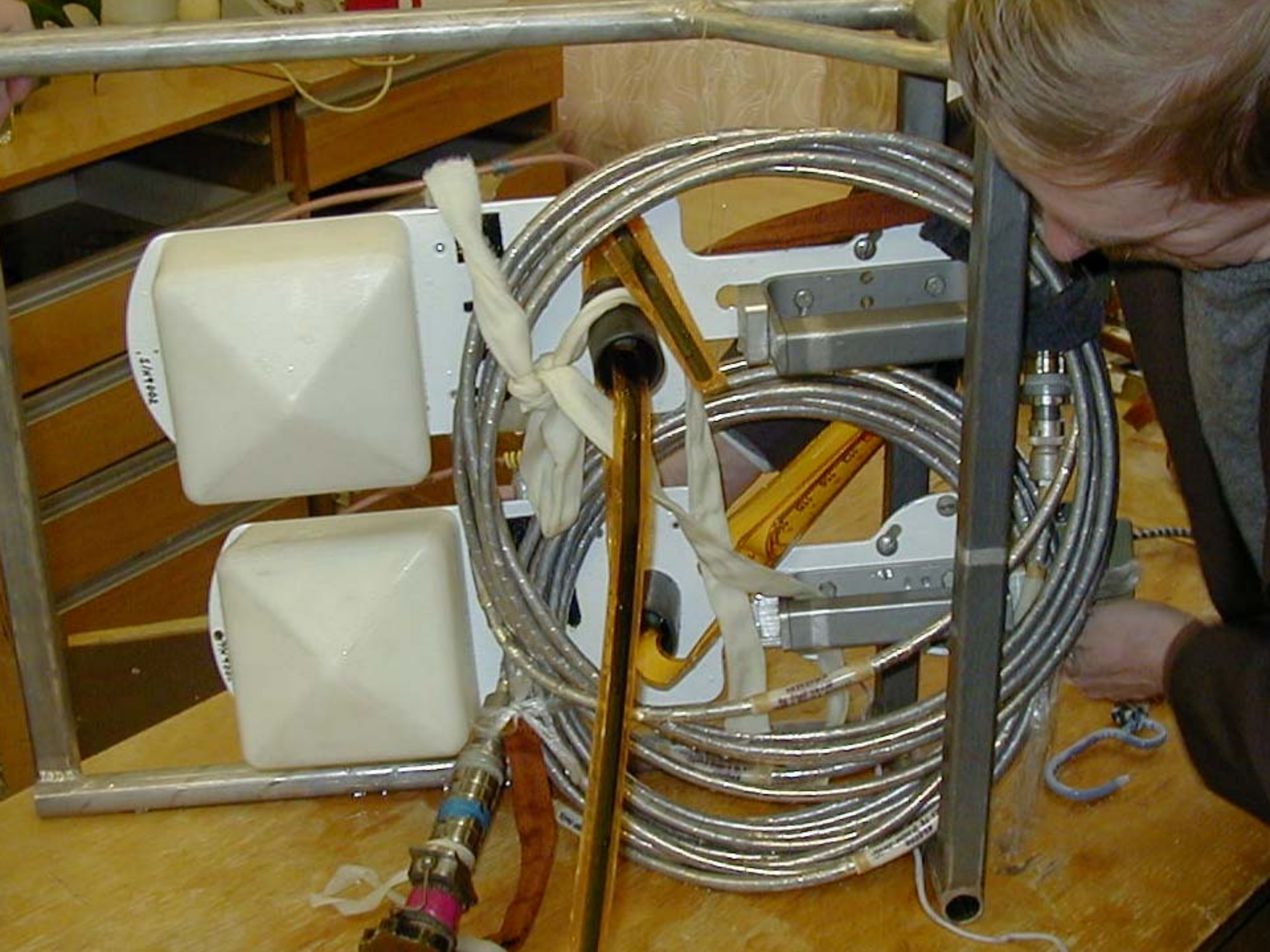


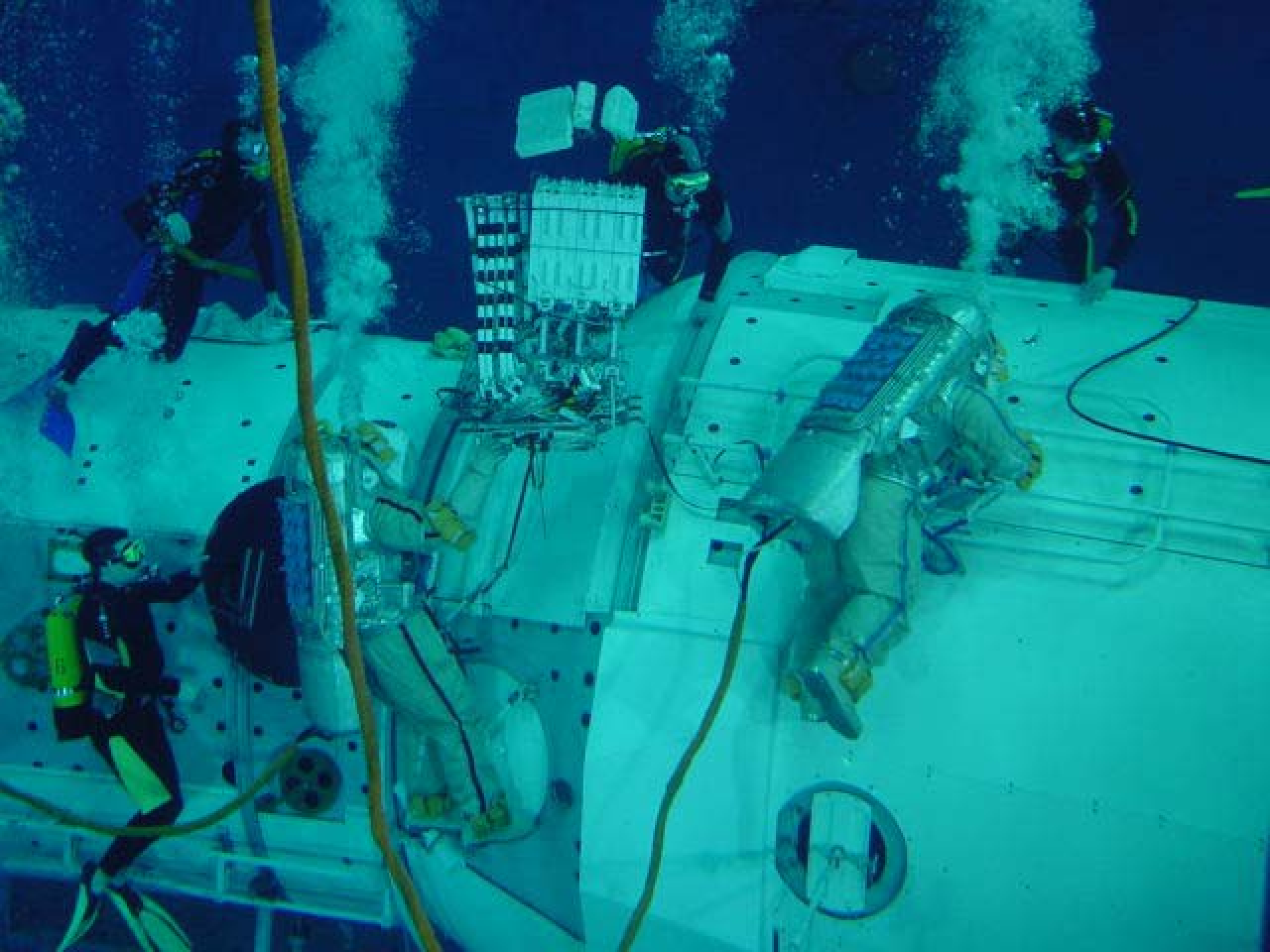
Flight Frame

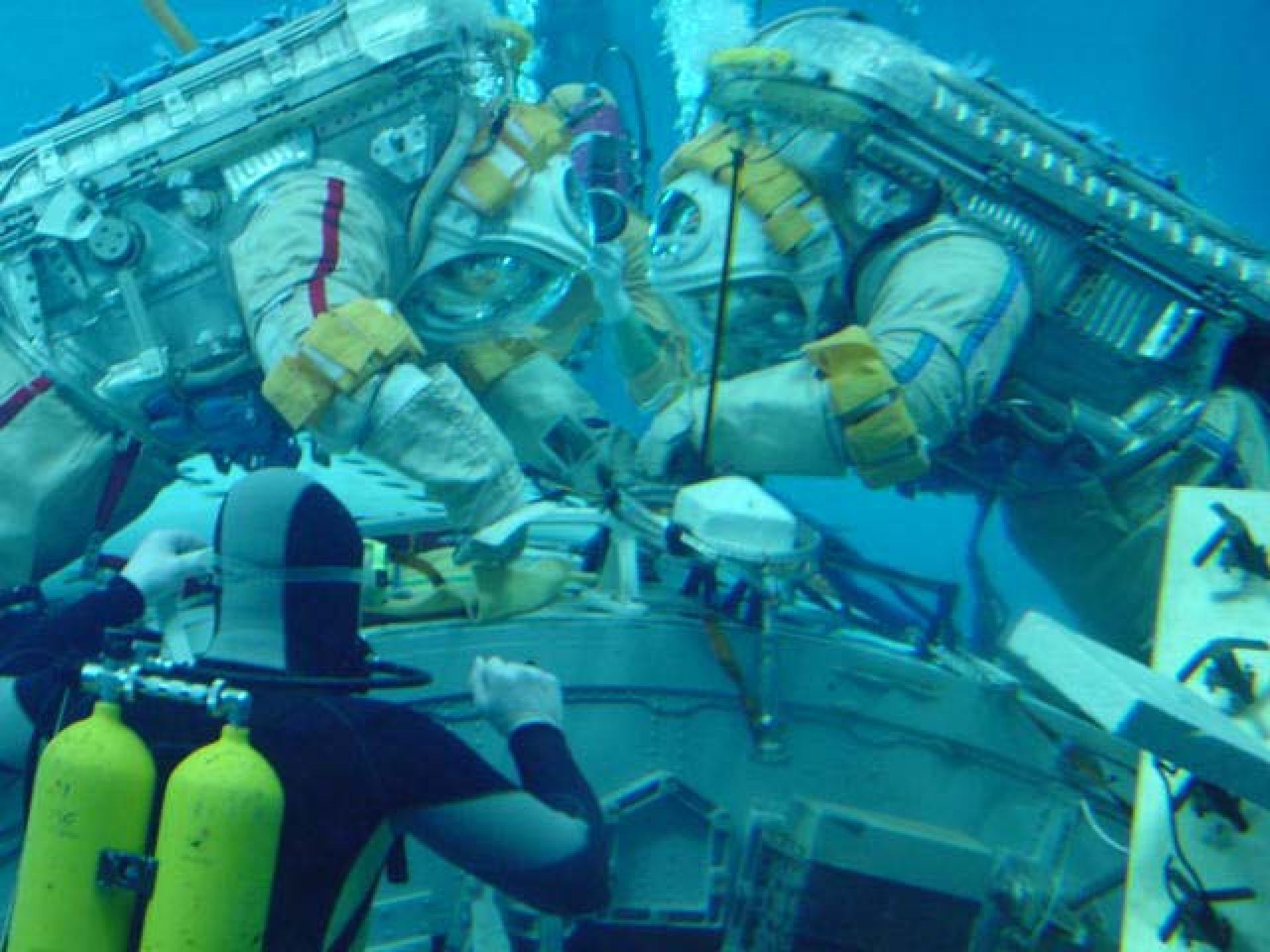
EVA Operations

Top-level plan

- Pre-EVA Activities:
  - Use velcro to “segment” each loop of EVA cable
  - Interface EVA Cable to diplexer
  - Using clamp, attach antenna systems to frame or spacesuit
- EVA Activities:
  - Traverse along SM to location of EVA RF Connectors
  - Fasten each antenna system to each handrail & lock in place
  - Deploy and tie-down EVA cable as each antenna system is routed to the specifically depicted handrail
  - Attach RF connectors for WA1-WA4





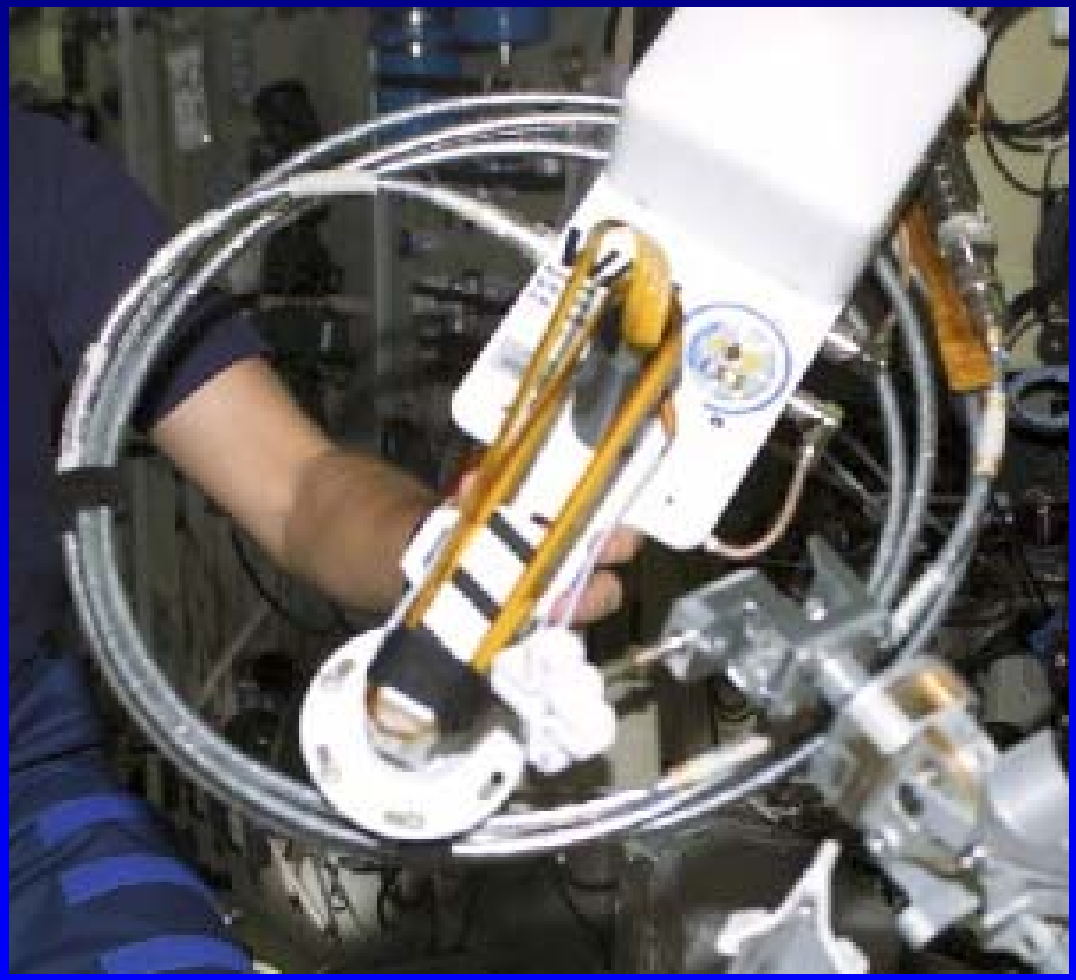


Antenna Installation Status

- Progress 6P flight, November 2001
  - Delivered EVA cable clips and velcro straps
- STS-108 (UF-1) December 2001
  - Delivered 4 antenna systems to ISS
  - Delivered additional Phase 1 hardware to support 2 radio (VHF/UHF) ops
- Expedition 4 & 5 crews install 4 antennas during Extra Vehicular Activities (EVAs)
  - WA3 on January 14, 2002
  - WA4 on January 25, 2002
  - WA1 & WA2 on August 26, 2002
- Awaiting testing planned at Energia in February/March timeframe to provide go-ahead to install radios to antennas

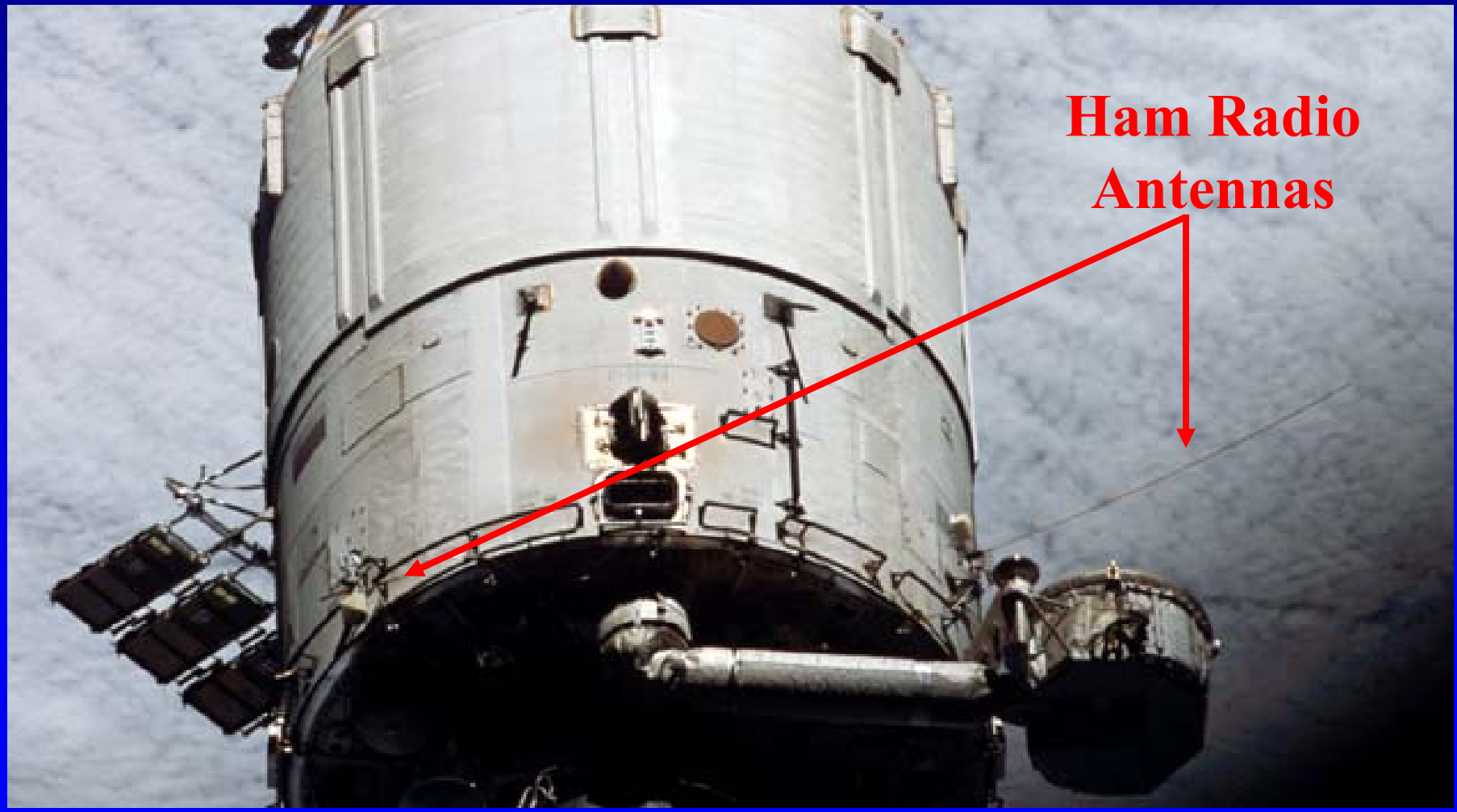
WA4 Antenna Ready for EVA

Velcro Development

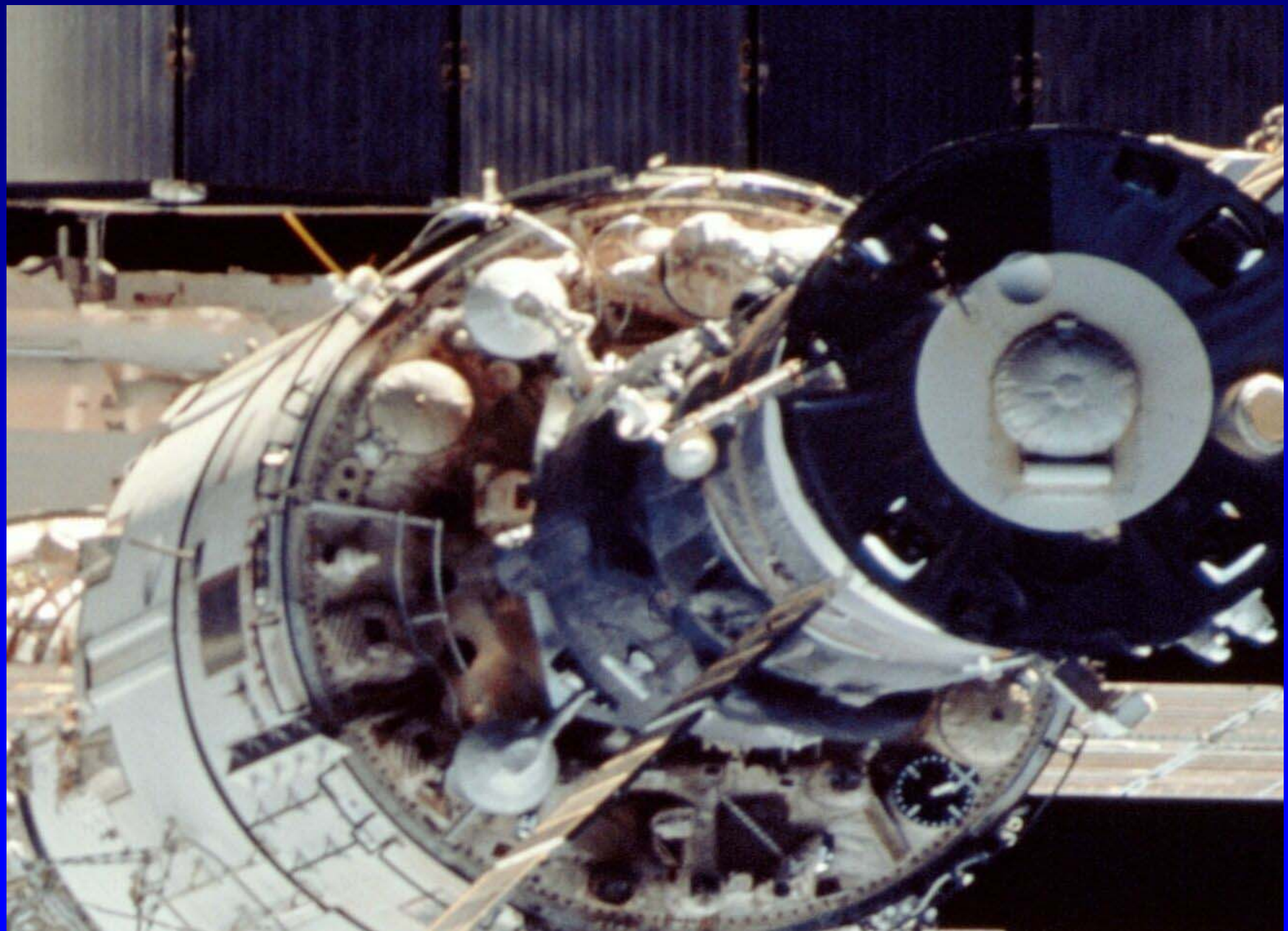


Antenna Installation EVA

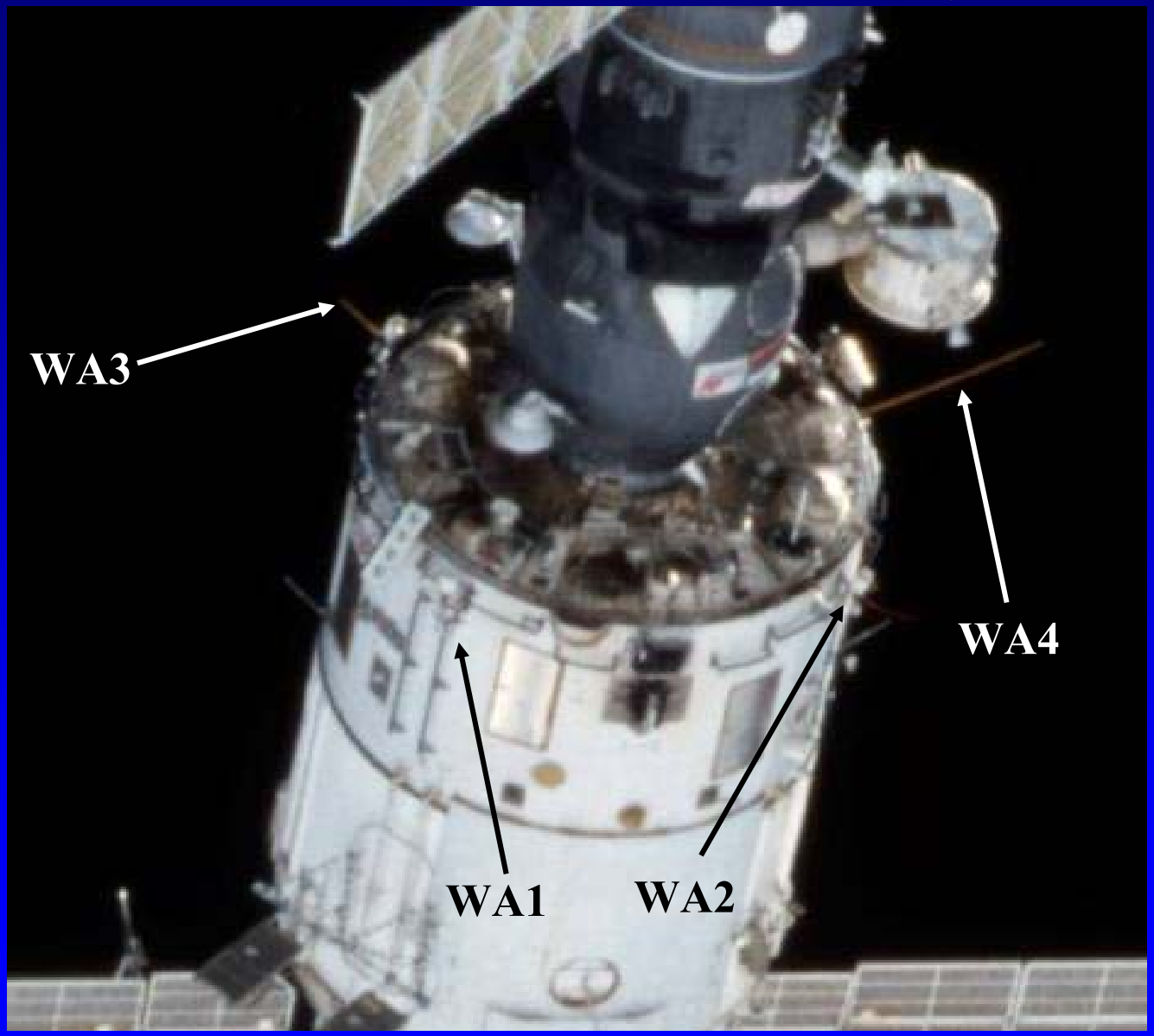
WA3 and WA4 Antennas on Service Module



WA3 Antenna



Antennas WA1-WA4 Deployed



Conclusions

- Very successful development and deployment of 4 antenna systems
- Very complex, international development and coordination effort
- Success is a testament of team's tenacity, international teamwork and drive
- Great Job!!

Four Antennas Deployed