ARISS Panel Session

22nd AMSAT Space Symposium

9 October 2004

Agenda

- ARISS Overview & Status
- ARISS Regional Team Reports
  - Canada
  - Europe
  - Japan
  - Russia
  - USA
- NASA's Vision for Space Exploration and Ham Radio's Future Participation
- Questions & Answers

Amateur Radio on Human Spaceflight Missions

Since 1983, organizations in the U.S. (SAREX), Germany (SAFEX) and Russia (MIREX), have worked with the space agencies to fly amateur radio and to support Educational Outreach on:

Space Shuttle

ISS

Mir

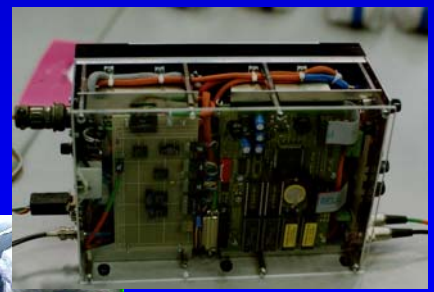
ARISS Objectives

Spark Student's Interest
In Science & Technology

Crew Family Contacts
(Crew Psychological Ops)

Promote Interest
In Amateur Radio

Human Spaceflight
Awareness



Experimentation

Development & Operations on the International Space Station (ISS)

Working with our international partners to develop & operate Amateur Radio on the International Space Station (ARISS)

ARISS Organization

- Five major regions coordinate ARISS activities—Canada, Europe, Japan, Russia and United States
- MOU—Formed ARISS to represent the amateur radio community to the ISS Program
- All volunteer organization

ARISS HARDWARE DEVELOPMENT

Development to be conducted in four phases

- **Initial Amateur Station (Phase 1 is on-orbit)**
- **Transportable Amateur Station—Phase 2 (Developing/On-Orbit)**
- **Permanent Amateur Station (Future)**
- **Express Pallet/External Experiments (Developing & Future)**

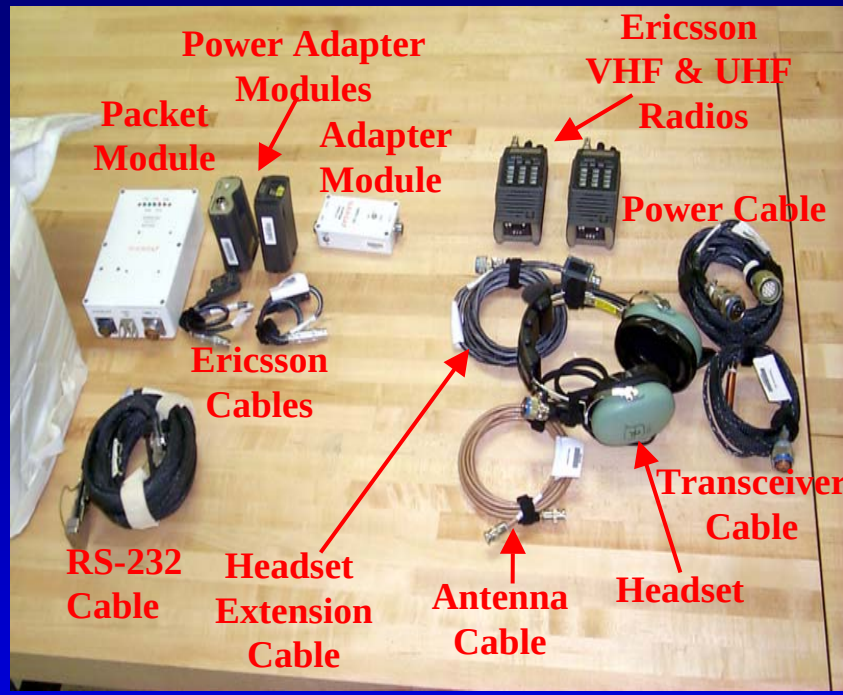
Installation/Launch Status (2000-2001)
4 Launches in 2 Years!!

- STS-106 (2A.2B), September 2000
  - delivered Phase 1 VHF & UHF Ericsson radios to ISS
  - VHF FM (144 MHz) radio system installed in Zarya (FGB) & attached to Sirius antenna system
  - Supports voice & packet ops
- Soyuz Flight 2R
  - Increment 1 crew activates VHF equipment on November 13, 2000 (14 days after crew arrives)
- STS-105 (7A.1) August 2001
  - Delivered new packet module to support simultaneous 2 radio (VHF/UHF) ops in FGB & Service Module
- Progress 6P flight, November 2001
  - Delivered Russian antenna hardware
- STS-108 (UF-1) December 2001
  - Delivered antenna systems and add'l hardware to support 2 radio ops

Ham Station Location: Service Module and FGB

- **Initial ops in FGB**
  - **Using Phase 1 VHF radio system**
- **Primary ops in Service Module**
  - **Multi-mode, multi-operator capability after installation of 4 antenna systems**

Phase 1 (SAREX) Hardware Status



- Ericsson 2 meter radio operational on voice in FGB
  - *"Best downlink audio on ISS"* Bill Shepherd, November 2000
- Packet Module operates for 1-2 orbits after power off
  - Needs to be reset by the crew (waiting for 1.5 years for this)
- Ericsson 70-cm radio awaiting installation in Service Module
- Preparing replacement headset and extension cable for launch on Progress

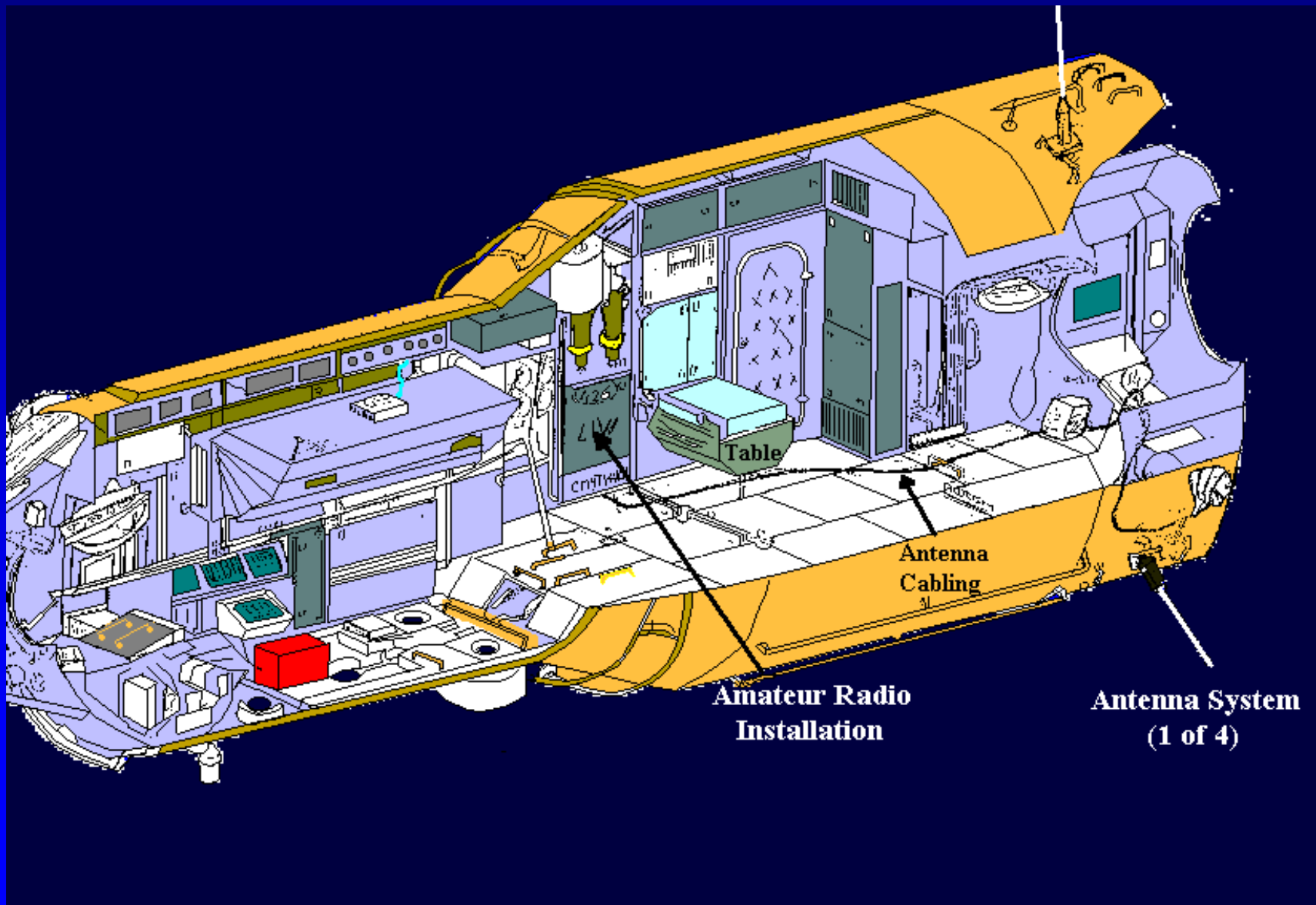
Planned Capabilities for Phase 2 Station

- Phase 1 VHF & UHF Systems
- Higher power (25 W) VHF & UHF FM Radio System
- HF (shortwave) radio system for ionospheric experimentation
- Packet Radio
- SSTV

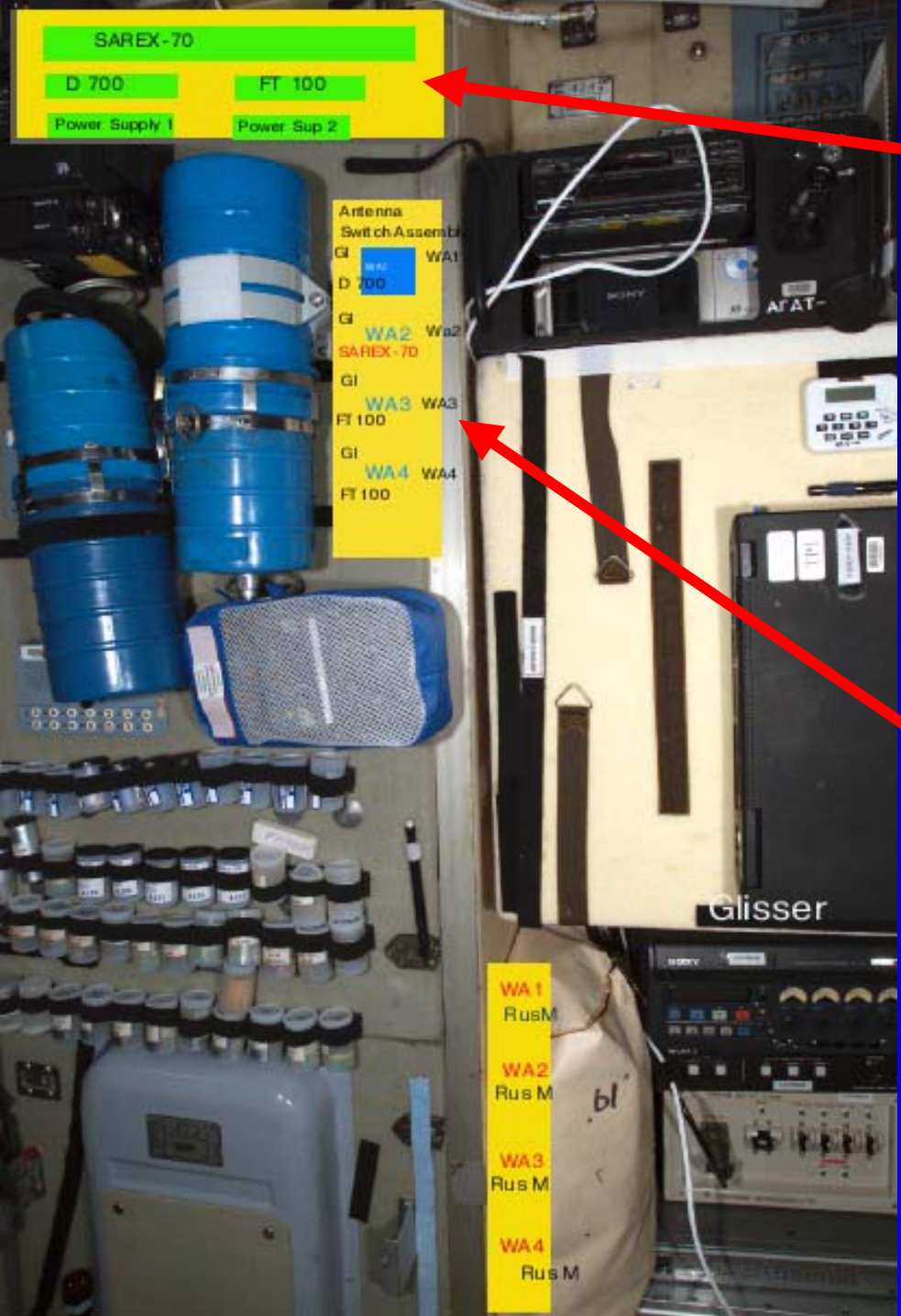
Supports Multi-Band, Multi Operator

Autonomous and Crew-tended Modes

ARISS / ISS HAM
Location in and on the Service Module

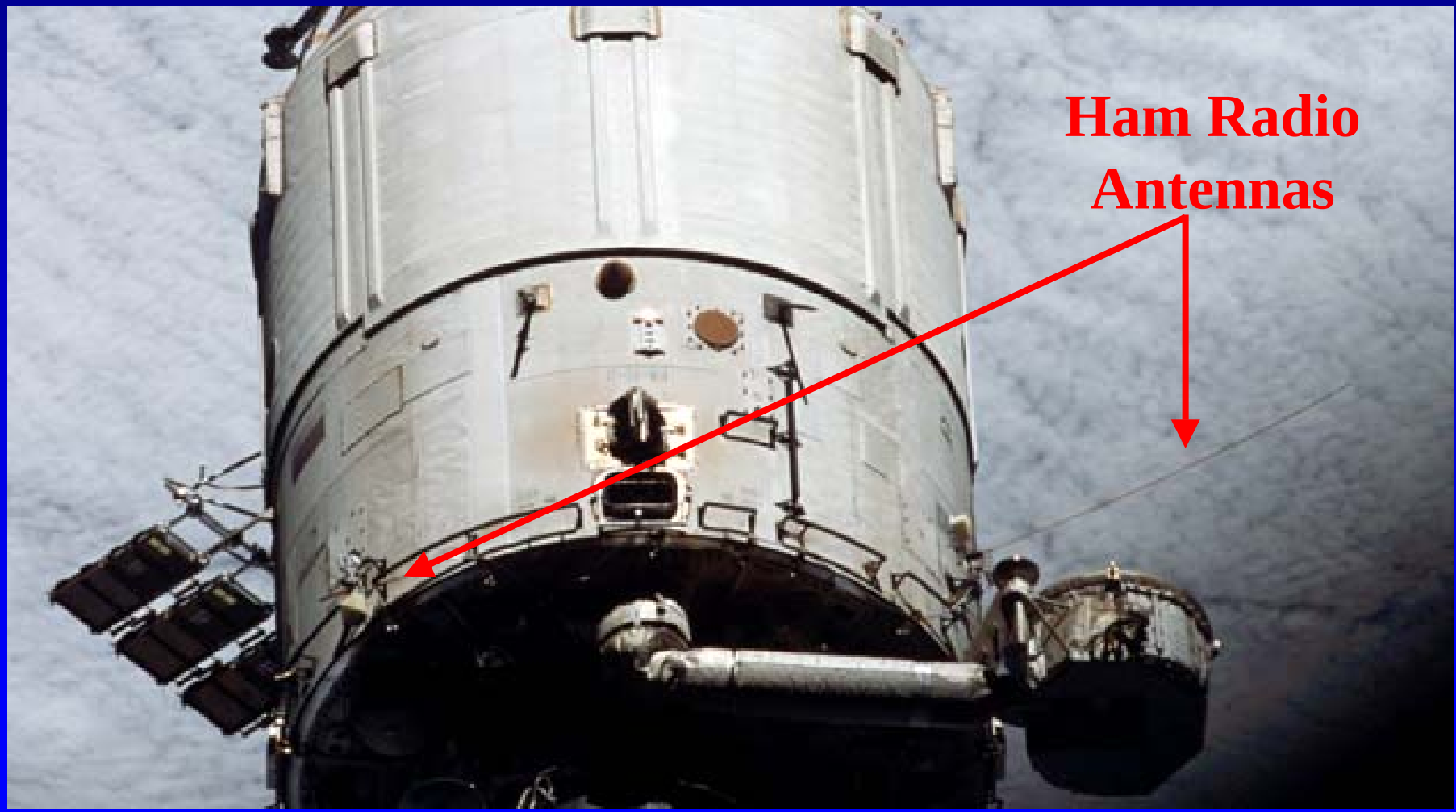


On-Orbit Layout of ISS Ham Equipment in Service Module

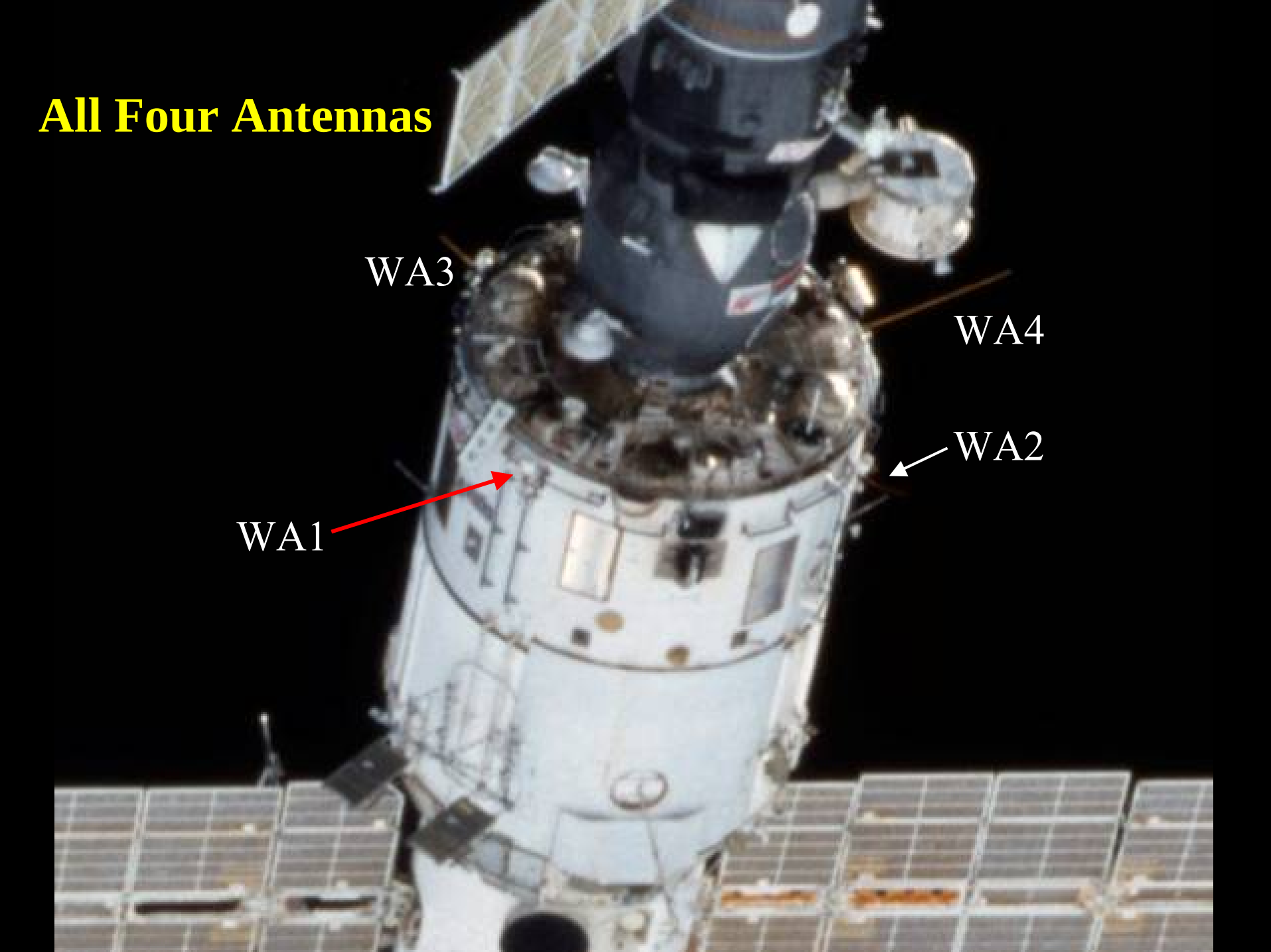


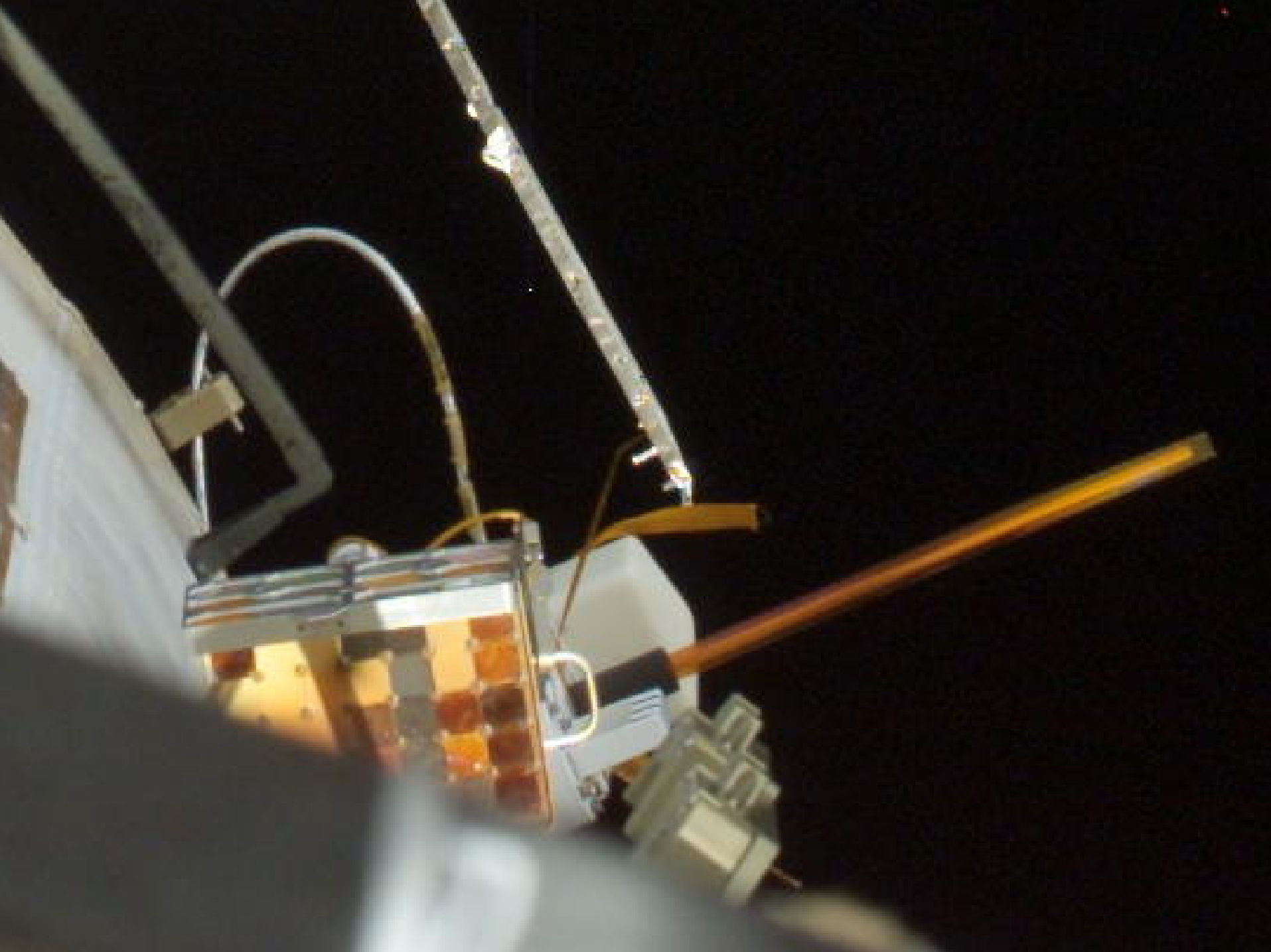
Antenna Systems WA1-WA4

WA3 and WA4 Antennas on Service Module



All Four Antennas





Installation/Launch Status (2003-2005)
3 Launches in 3 Years!!

- Progress 12P flight, August 30, 2003
  - Delivered Kenwood D-700E Radio System Hardware to ISS for Phase 2
  - Delivered Energia Power Supplies
- Progress flight, Early 2005
  - Deliver Yaesu FT-100D Radio System Hardware for Phase 2
  - Deliver SSTV Hardware and Software
  - Deliver Phase 1 Headset & Headset extension cable
- Shuttle Return to Flight, (LF1) Early 2005
  - Deliver MISSE-5/PCSAT2 External Payload

Progress 12P w/ ISS Ham Hardware Prepares to Dock with ISS

Transitioning to Joint Operations in FGB and Service Module

Kenwood D-700E Closeout Photos
5 Program Modes

PM 1 Voice

PM2 Crossband Repeater

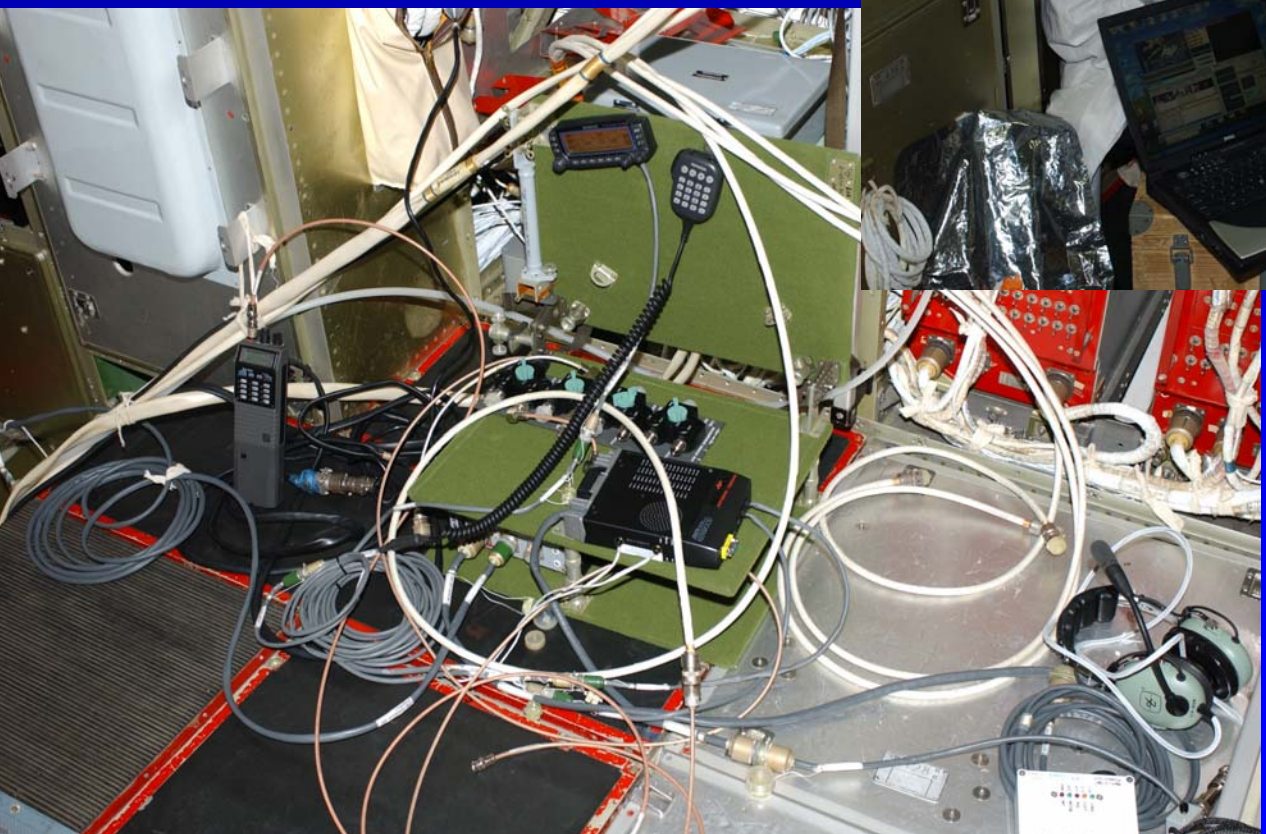
PM 3 APRS

PM 4 Packet

PM 5 Emergency& 9600 Packet

Phase 2 Hardware Status

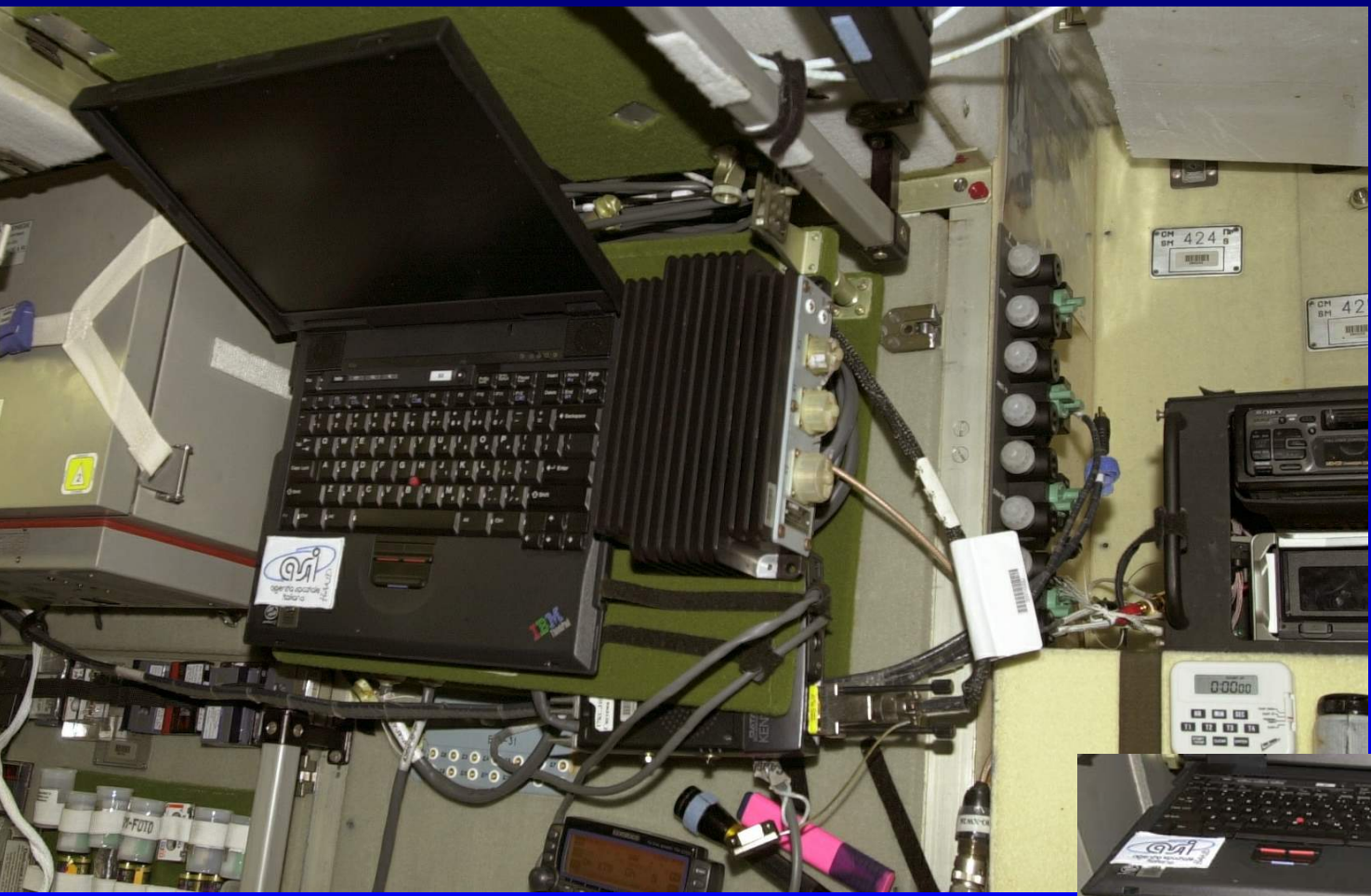
- November 2003 tests in Energis KIS facility, Moscow, Russia, cleared D700 radio system for future installation and use



Phase 2 Hardware Status

- D700 Russian & US Engineering Test Passes successfully completed
- Kenwood D700 & WA2 Antenna System Operational on 2 meters
  - General voice QSOs
  - Packet
  - Voice Repeater
  - School group operations
  - 70 cm operations

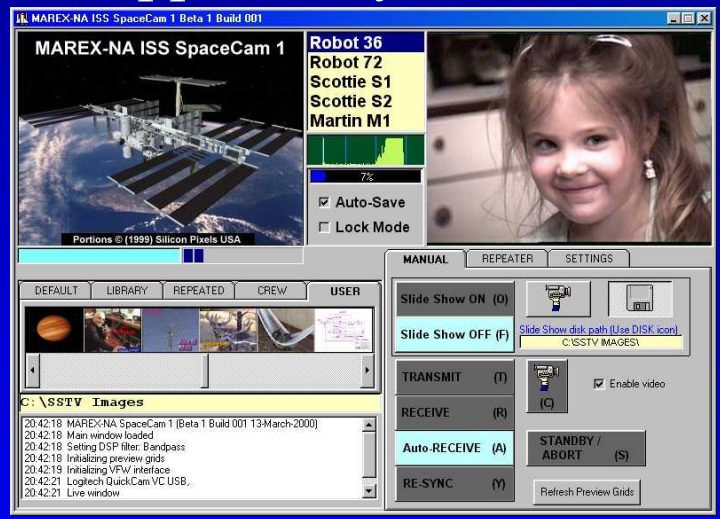
Phase 2 Hardware Status



Future ISS Hardware Deployments

- SSTV—Late-2004
- Phase 2 Yaesu hardware—2005
- External payload—1st payload (MISSE-5/PCSAT2)—Early 2005
- ARISS-EU Columbus Module Antenna Opportunity—2006-2007

Yaesu FT-100



SSTV Software

MISSE-5/PCSAT2

2 Meter Operations

- Downlink:
  - Worldwide both voice & packet: 145.80
- Uplink:
  - Packet: 145.99
  - Region 1 voice: 145.20
  - Region 2 & 3 voice: 144.49
- Callsigns:
  - RS0ISS
  - NA1SS
  - PI9ISS (Andre Kuipers)
- Crew Schedule
  - ~0700 to 1900 UTC
  - Off Saturday Noon to Sunday evening

70 cm Operations

- Voice: 437.55 used during field day
- Repeater ops:
  - 437.8 up
  - 145.8 down
- Callsigns:
  - DL0ISS
  - RS0ISS
  - NA1SS
- Crew Schedule
  - ~0700 to 1900 UTC
  - Off Saturday Noon to Sunday evening

ARISS Special Event
Roy Neal Commemorative Status

- Special Event performed November-December 2003
- Over 85 USA and dozens of international QSOs on Voice & Packet Operations using Kenwood D700
- Expedition 8---Mike Foale and Alexander Kaleri—THANKS!!
- Printing and distribution of certificates completed

This was a fitting tribute to a truly remarkable person.

Roy---thanks for all the mentoring, guidance and support to the ARISS Program

ARISS

The Amateur Radio on the International Space Station Team

Presents the

Roy Neal, K6DUE International Space Station Commemorative Certificate

to

Frank H. Bauer, KA3HDO
2-way Voice

for Successful Communication with the ISS
November • December 2003

First ham radio operations by humans in space
STS-9 Space Shuttle *Columbia* mission
Owen Garriott, W5LFL, operator
November-December 1983

Ham radio operations on the
Mir Space Station
November 1988

Ham radio operations on
the International Space Station
November 2000

First Multi-Station, Multi-Band Operations on a Human Tended Vehicle
ISS Field Day Operation 2004

Mike Finke, KE5AIT
2 meter ops using NA1SS

Gennady Padalka, RN3DT
70 CM ops using RS0ISS

Mike Finke Works All 7 Continents

Palmer Station, Antarctica

Expedition 9 Accomplishments

- First ARRL Field Day with 2 station operation (RS0ISS & NA1SS)
- First ARRL Field Day with 2 bands active (70 cm and 2 meters)
- First 70 cm voice operation on ISS
- First crossband repeater operation on ISS (437.8↑/145.8↓ MHz)
- Completed checkout of Kenwood radio operations
- 13 School contacts and 2 special event contacts
- Over 100 random contacts logged
- First ISS crewmember to work Antarctica direct from space
- First ISS crewmember to work all 7 continents from space

Thank you Mike & Gennady!