

# Amateur Radio On The International Space Station (ARISS)

## The First Educational Outreach Program on ISS



*53<sup>rd</sup> International  
Astronautical Congress  
World Space Congress  
October 15, 2002*

**Carolynn Conley, Muniz Engineering**

**Frank H. Bauer, NASA GSFC**

**Debbie Brown, Teaching from Space Program**

**Rosalie White, ARRL**

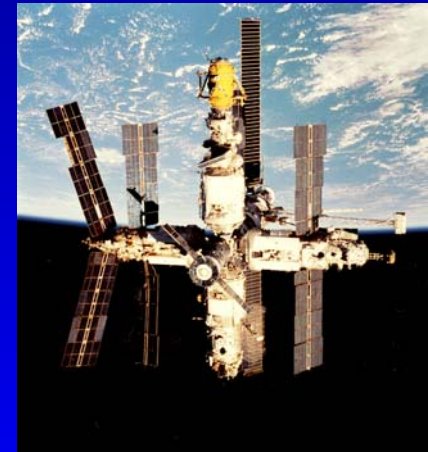
# Amateur Radio on Human Spaceflight Missions

*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**

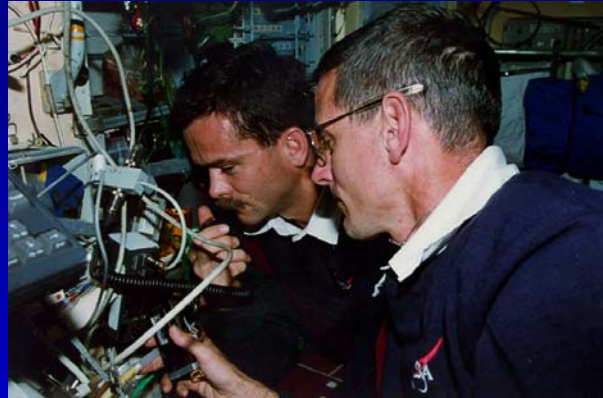


**Mir**

# ARISS Objectives



Spark Student's Interest  
In Science & Technology



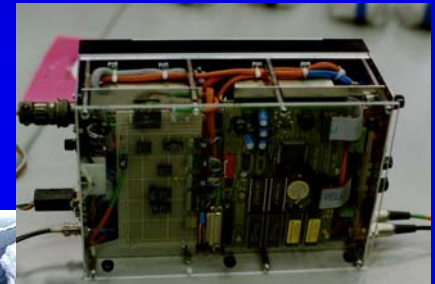
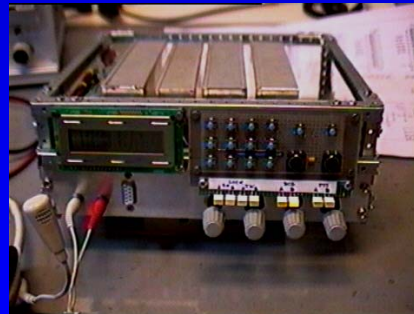
Crew Family Contacts  
(Crew Psychological Ops)



Promote Interest  
In Amateur Radio



Human Spaceflight  
Awareness



Mir SSTV  
Dec 12 99 17:29 UTC Rec W8ZCF

Experimentation

# Development & Operations on the International Space Station (ISS)

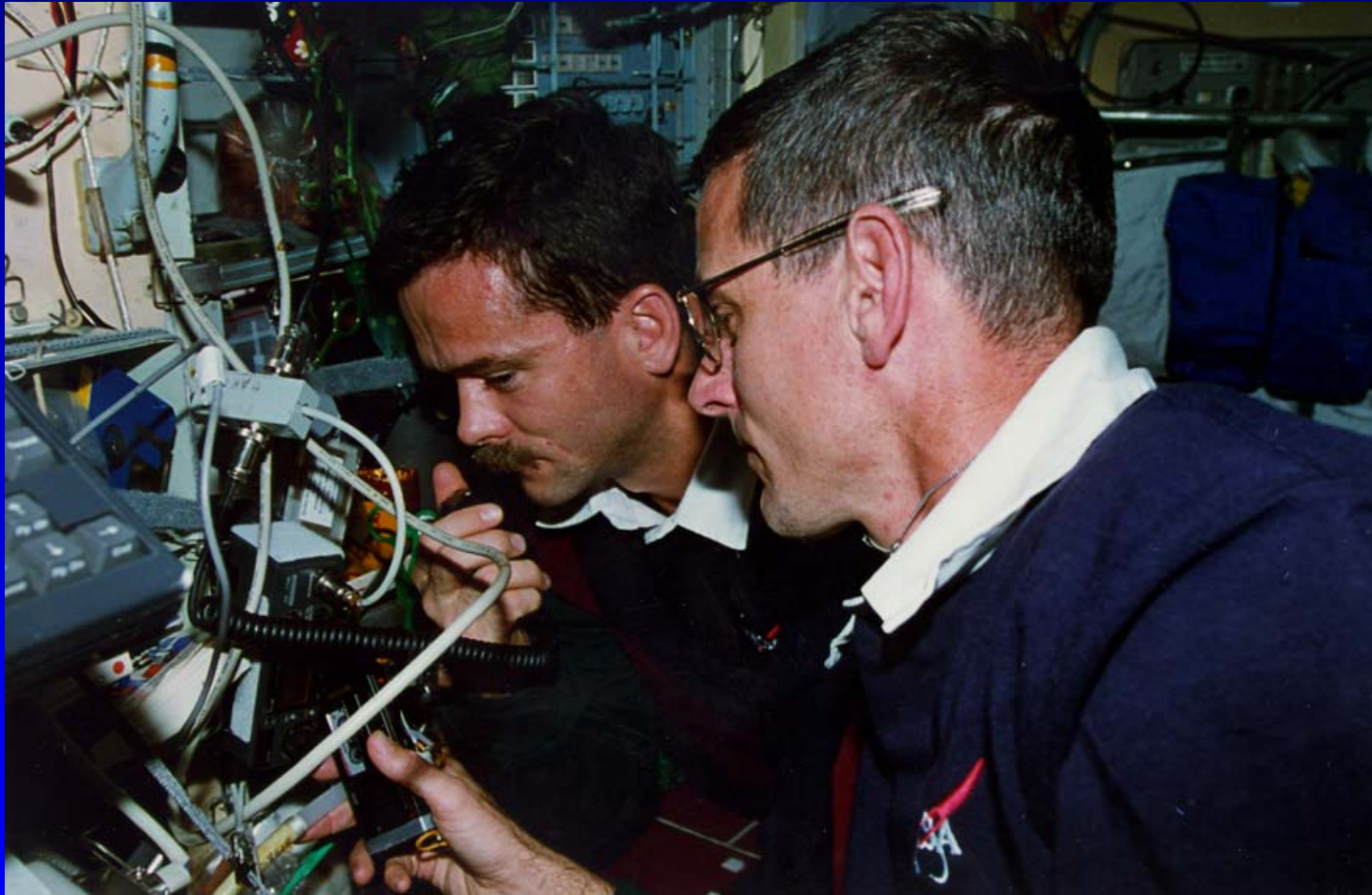
*Working with our international partners to develop & operate Amateur Radio on the International Space Station (ARISS)*

## ARISS Organization

- Nine international partners thus far—Belgium, Canada, France, Germany, Italy, Netherlands, Japan, Russia and United States
- MOU—Formed ARISS to represent the amateur radio community to the ISS Program
- Rules & Bylaws developed with delegates from Europe (4), America (4), Russia (2) and Japan (2)



# Planned Capabilities for Initial Station ISS Ham Phase 1



**2-way voice**

# Planned Capabilities for Initial Station ISS Ham Phase 1 (Continued)

Posted : 06/28/97 17:58

To : ALL

From : R0MIR

Subject: Mir Status

## Computer-to- Computer Radio Links

We have now got the base block, the module Kvant 2 back on line, leaving 2 more modules. Working very hard, lights in our mouths, in the dark, moving batteries about, to enable better charging, with solar arrays. O2 electrolysis soon, in old Kvant. Much interest from control center to do internal eva to reconnect power to lost Spektr module, to receive its substantial electrical power from its large arrays.

Thanks for all your good wishes. Mike.

CMD(B/H/J/K/KM/L/M/R/S/SR/V/?)>

**Amateur Radio  
E-mail from Mike  
Foale after Progress  
collision with Mir  
Spektr Module**

# Planned Capabilities for Initial Station

## ISS Ham Phase 2



**DigiTalker**  
(Voice Repeater)



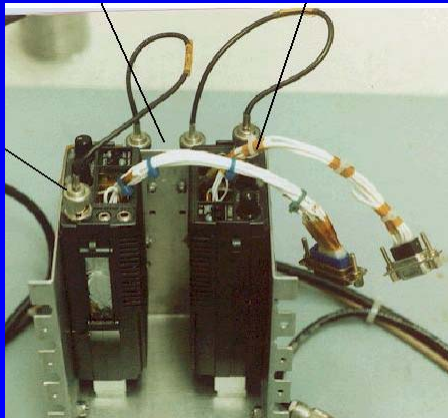
**Slow Scan TV**  
(Photos/JPEG Images)

# Future Capabilities

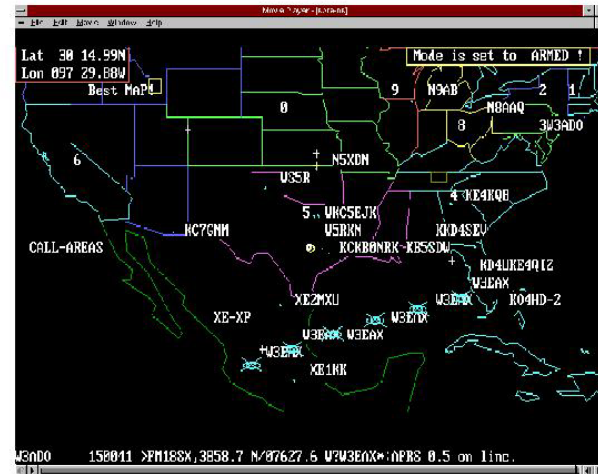


## Amateur TV

(Standard, Spread spectrum, & MPEG)



## SPRE Pass Over U.S.

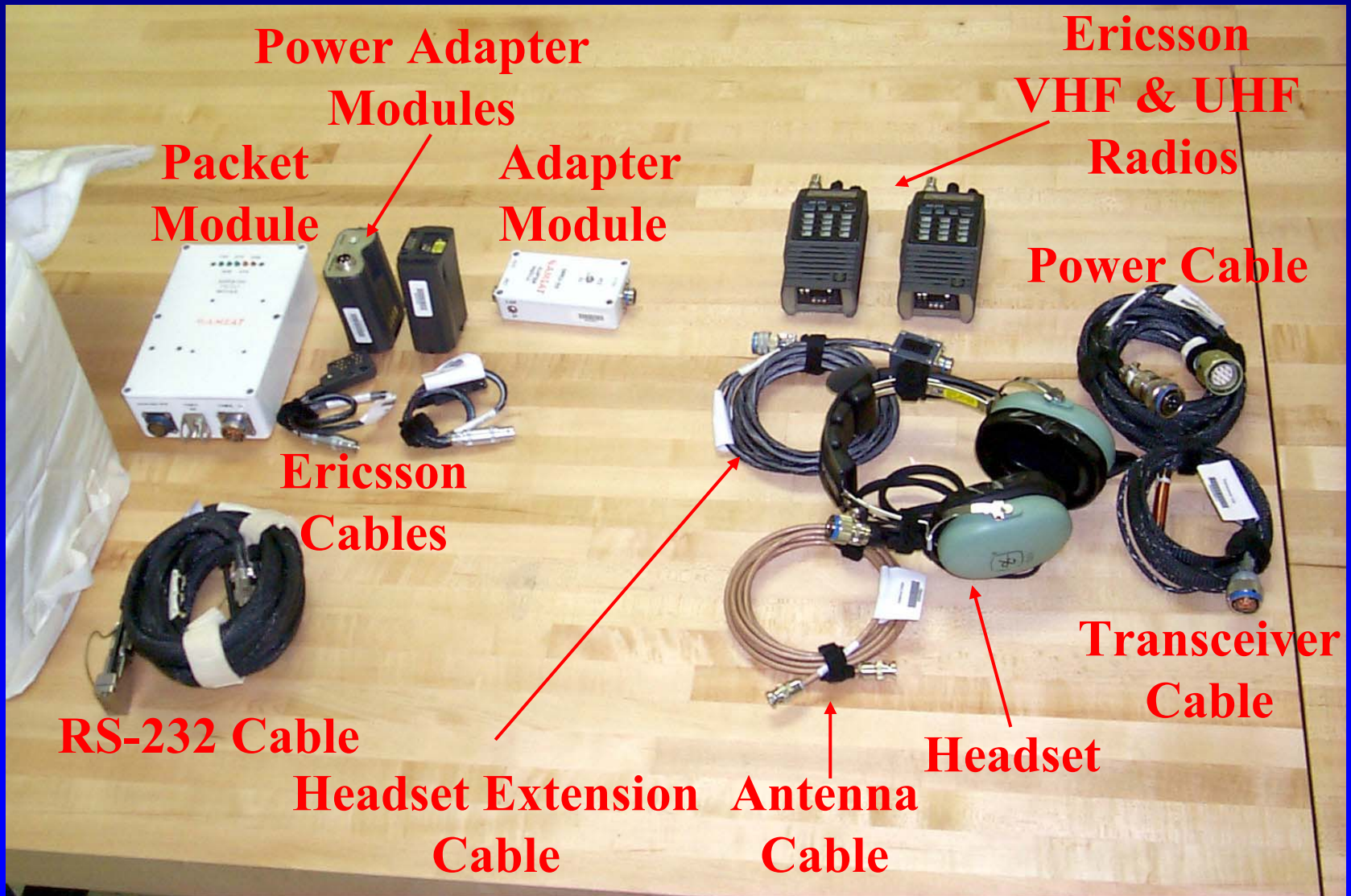


R/T Internet TLM  
using amateur radio

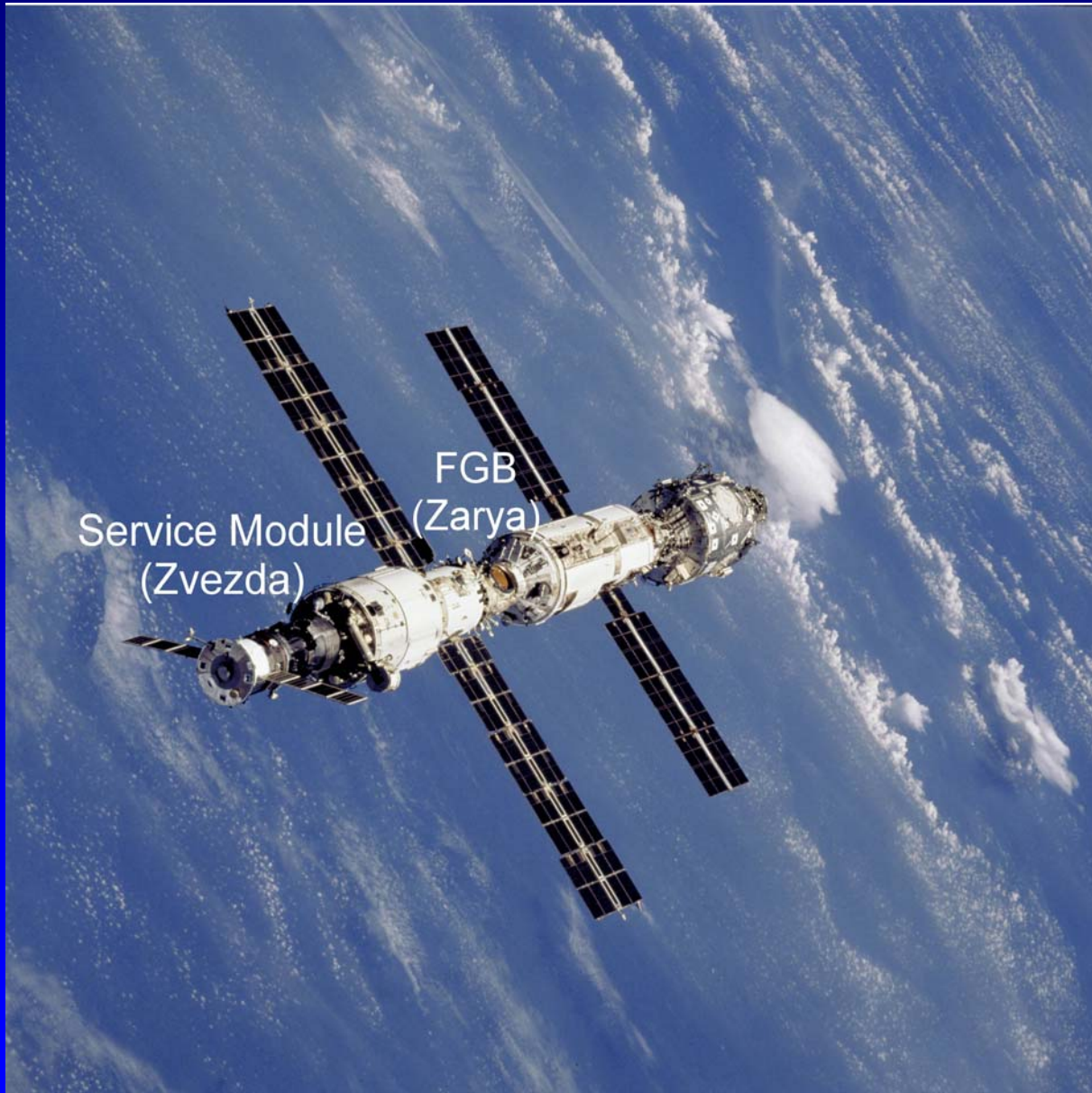
Express Pallet---  
External payloads w/  
antennas & student  
experiments



# ARISS Provided Hardware to ISS HAM at SPACEHAB for Launch on STS-106 (2A.2b)

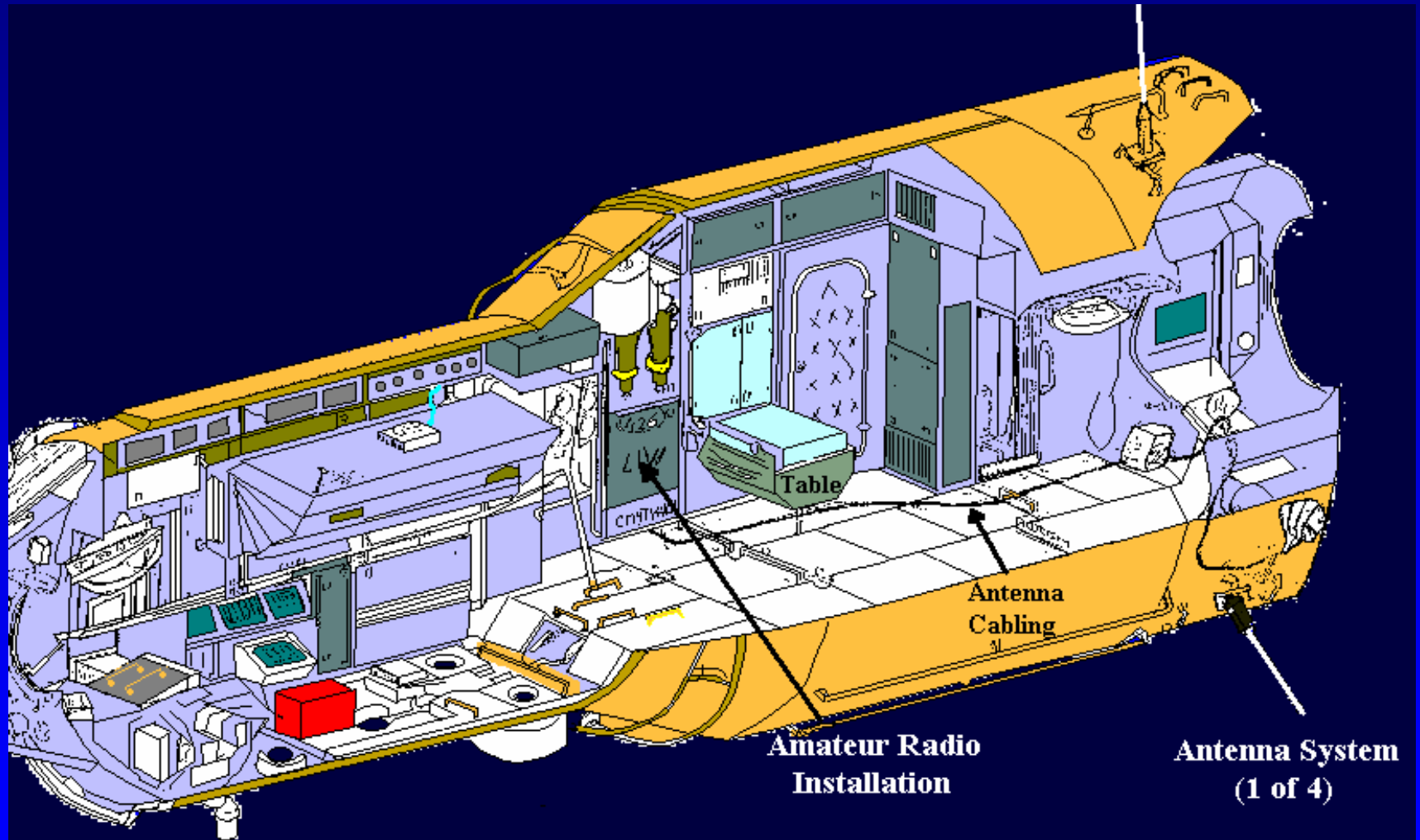


# Service Module and FGB



# ARISS / ISS HAM

## Location in and on the Service Module



# ARISS Hardware Location in Service Module

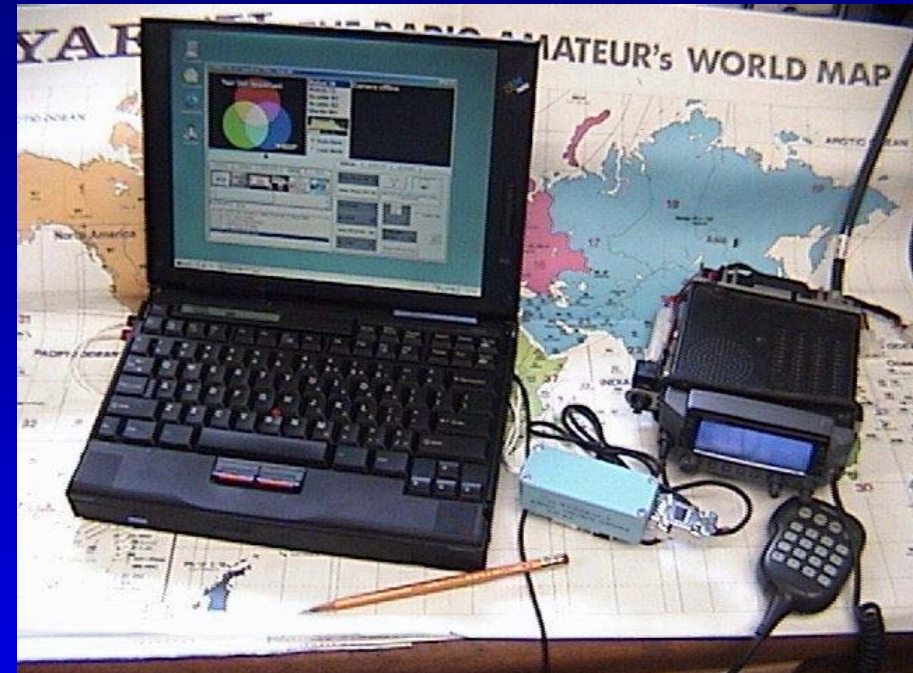


**ARISS Team Members Sergej Samburov (Russia), Frank Bauer (US) & Alberto Zagni (Italy) (L to R) in front of ARISS Hardware Installation Area**

# Antenna Systems WA1-WA4



# Next Up: SSTV



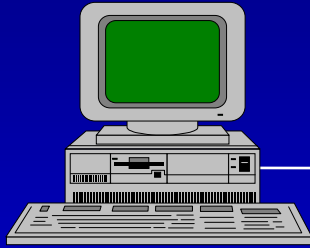
SpaceCam 1 H/W & S/W

# Operations

- Downlink:
  - Worldwide both voice & packet: 145.80
- Uplink:
  - Packet: 145.99
  - Region 1 voice: 145.20
  - Region 2 & 3 voice: 144.49
- Callsigns:
  - DL0ISS
  - RS0ISS
  - NA1SS
- Crew Schedule
  - ~0700 to 1900 UTC
  - Off Saturday Noon to Sunday evening

# DIRECT CONTACT INSTALLATION

PC WITH ORBIT  
PREDICTION  
PROGRAM  
AND TRACKING  
INTERFACE



ROTOR  
CONTROL  
UNIT

CIR. POL.  
YAGI

AZ/EL  
ROTOR

ANTENNA  
PREAMP

2 METER  
VERTICAL

COAX

ROOF TOP

AC  
POWER

12 V  
POWER  
SUPPLY

2 METER  
TRANSCEIVER

2 METER  
AMPLIFIER  
80-170 W

PRIME STATION

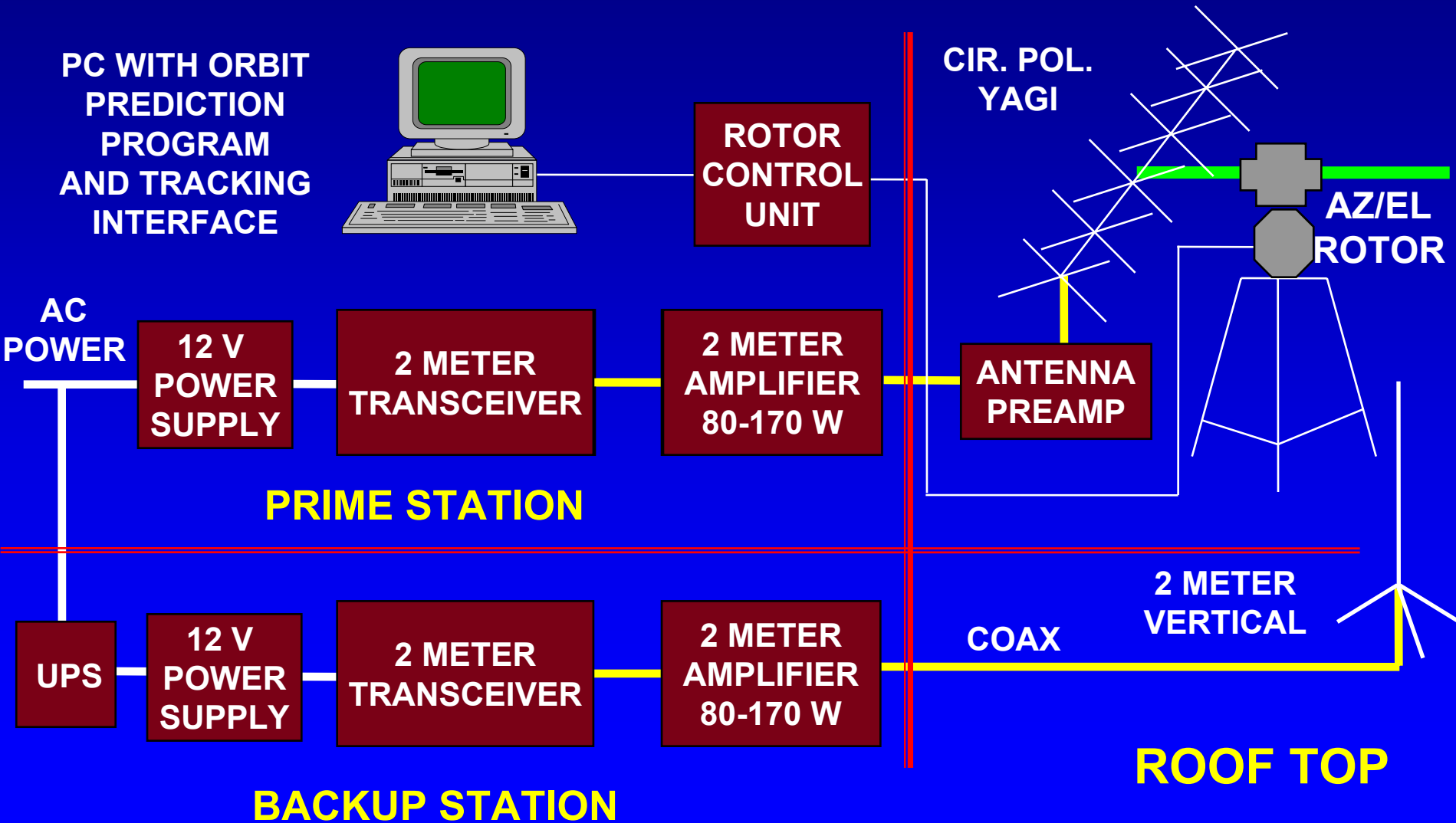
UPS

12 V  
POWER  
SUPPLY

2 METER  
TRANSCEIVER

2 METER  
AMPLIFIER  
80-170 W

BACKUP STATION

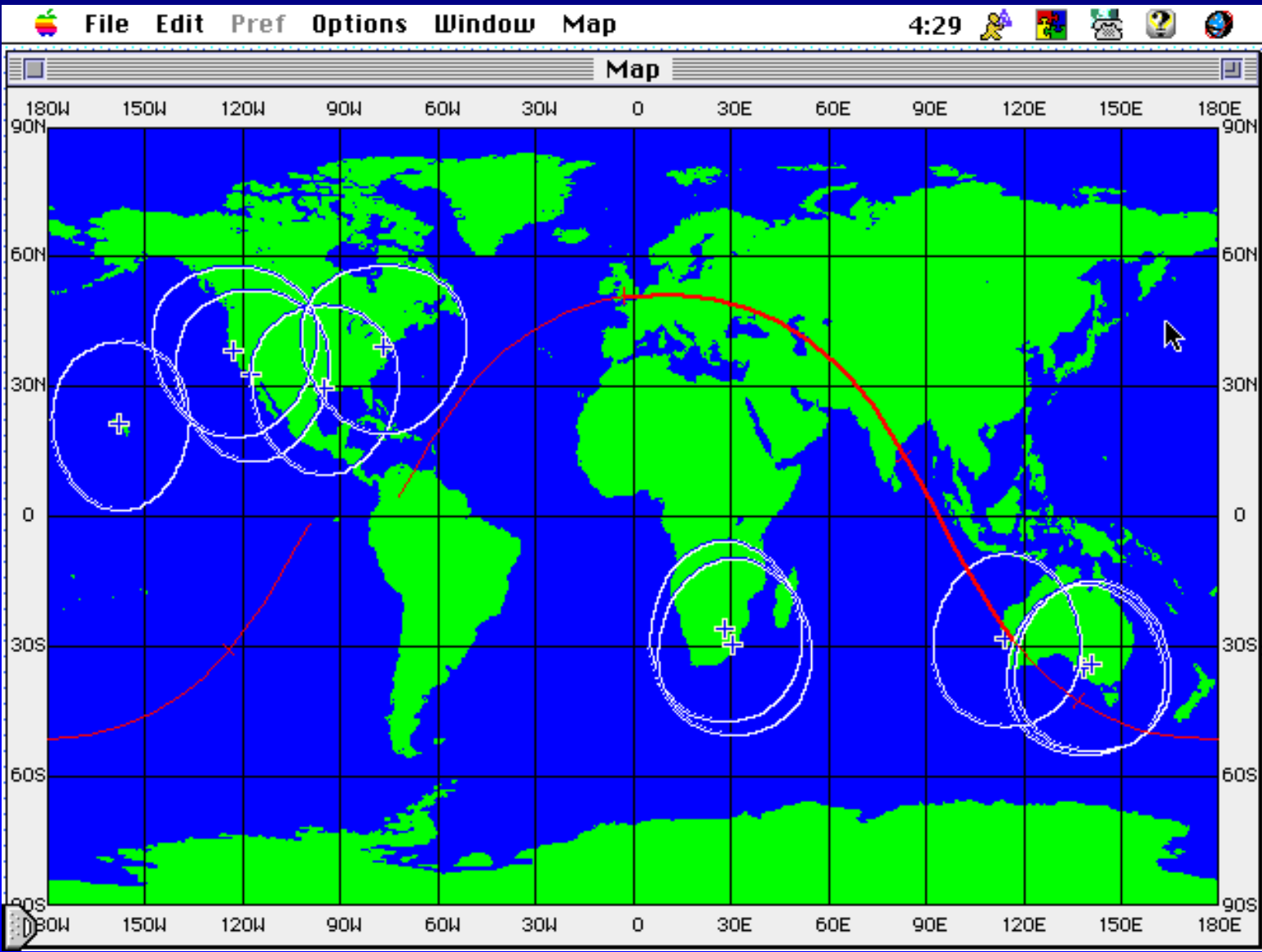




# Telebridge Communications Links



# Telebridge Network



# QSL Card



# Expedition 1 Crew

## November 2, 2000-March 18, 2001



**Sergei Krikalev, U5MIR Bill Shepherd, KD5GSL Yuri Gidzenko**

- 2m voice commissioned
- Packet turned on, no beacons
- Six schools in Canada and USA
- Some general contacts
- Crew very busy!

# Exp 1 School group contacts



- Started December 21
- About once a week was the goal
- Seven total: 3 crew pick, 4 old
- Shuttle gaps were a big issue
- Lack of good orbital predictions, short notice of which pass will be supported



# Expedition 2 Crew

## March 19-August 12, 2001



- Numerous general QSOs
- Fourteen school events
- Packet debugging
- International schools
- Balanced ops
- Field day ops

Susan Helms, KC7NHZ, Yuri Usachev, UA9AD & Jim Voss

# Susan Helms on the Air during Field Day



## Field Day Results:

- 250 stations contacted
- 202 after dupes removed
- Bonus Points:
  - Solar Power
  - Off Commercial mains
  - PR
- Total points: 1010



# Expedition 3 Crew

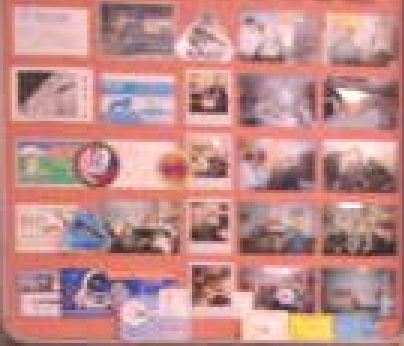
## August 12, 2001-December 5, 2001



- Lots of schools — 23 total
- Some general QSOs
- Packet enabled
- IMAX school contact
- No family passes requested—iphone related

Mikhail Tyurin, Frank Culbertson, KD5OPQ, Vladimir Dezhurov

# НАШИ ГОСТИ



# ИНФОРМАЦИЯ



# НАШИ БУДНИ



# KD50PQ in the ISS ham shack



# KD50PQ During JOTA



# Mark Shuttleworth School Group



# Lance Bass Celebrity Mission



# Expedition 4 Crew

## December 5, 2001-June 15, 2002



- 2 EVAs--External antennas on Service Module
- 2nd packet module RS0ISS
- Lots of school contacts

Daniel Bursch, KC5PNU, Yury Onufrienko, KC5TIE, Carl Walz, KC5TIE

# Expedition 5 Crew

## June 7, 2002-Present



- EVA to install final 2 antennas on Service Module
- Mark Shuttleworth computer interfaced to packet system
- Lots of school contacts, general contacts and packet e-mails

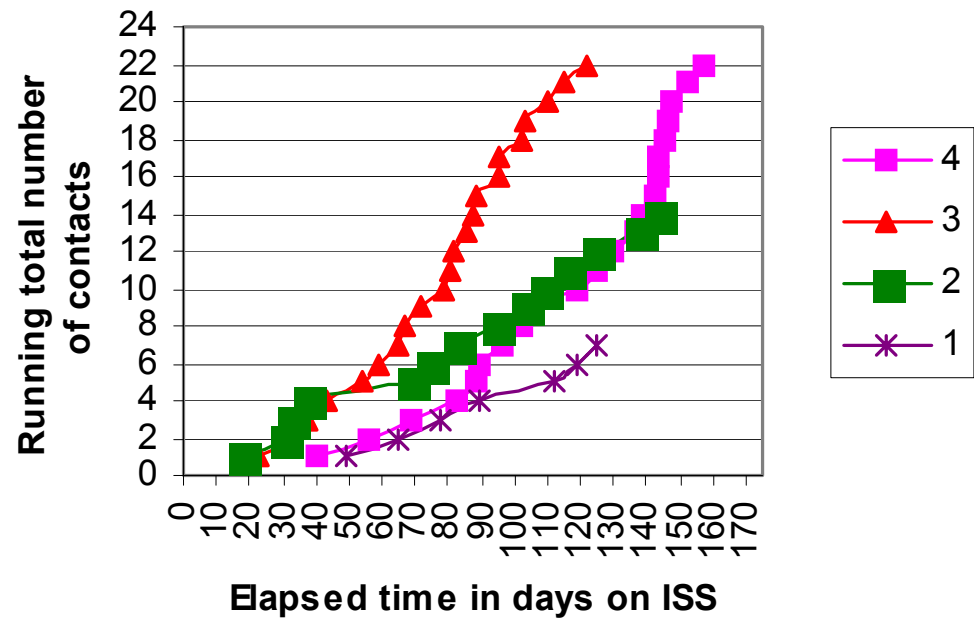
**Commander Valery Korzun**



# School Statistics

Crew Expedition	School Contacts
1	7
2	14
3	22
4	17
5	10
Tourists/Taxi Flights	5

Expedition 1 - 4 Running School Contact Total versus Elapsed Time



# SPACE STATION 3D

NARRATED BY  
TOM CRUISE



COMING SOON

OPENS 6 JUNE IN SYDNEY  
13 JUNE IN MELBOURNE

## Amateur Radio Debuts on 3D IMAX Film





# ARISS

## Amateur Radio on the International Space Station

### ARISS OVERVIEW

ARISS provides School Groups an 8 to 10 minute opportunity to talk to the astronauts and command on-board ISS. To date, over 50 schools have participated.

### ARISS OBJECTIVES

- Promote Interest In Amateur Radio
- Spark Student's Interest In Science & Technology
- Human Spaceflight Awareness
- Create Family Contacts
- Experimentation

### ARISS CAPABILITIES

**CURRENT**

**UPCOMING**

**FUTURE**

### INTERNATIONAL PARTNERS

- New International Partners: Spain, Canada, France, Germany, Italy, Netherlands, Japan, Korea, and the U.S.
- MOU - Formed ARISS to Engage Amateur Radio Community to the ISS Program
- Working Together to Develop and Operate Amateur Radio on ISS

### U.S. SPONSORS

- NASA
- AMSAT
- National Aeronautics and Space Administration
- AMSAT
- AMSAT

For More Information: [ariss.nasa.gov](http://ariss.nasa.gov)

<http://spaceflight.nasa.gov/mission/reference/radio/index.html>

Booth table with various electronic equipment, including a laptop, a radio, and other communication devices.

AMSAT HAM RADIO MICROSAT satellite model on a stand.

Small informational sign on the right side of the booth.

# ARISS Information

<http://ariss.gsfc.nasa.gov>

