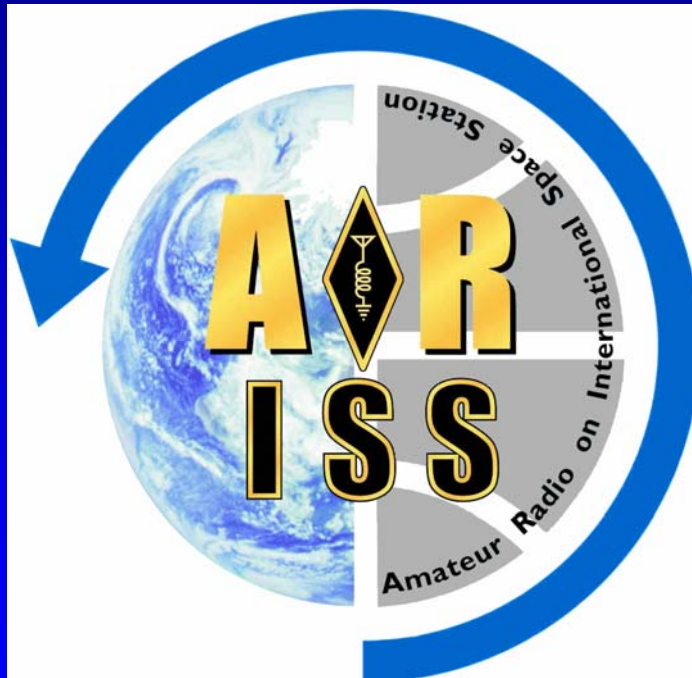


Amateur Radio On The International Space Station (ARISS) Status & Future Plans



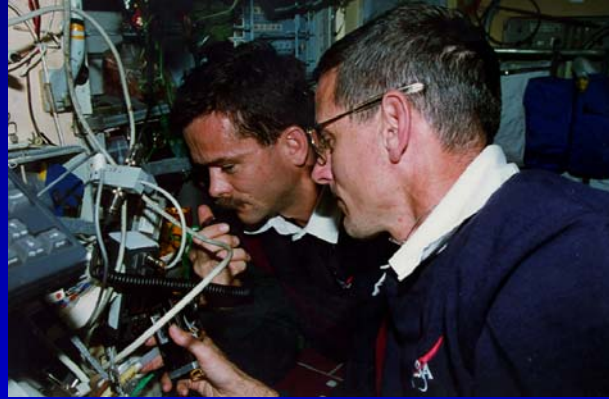
AMSAT-UK
20th Colloquium
University of Surrey
July 31, 2005

Frank H. Bauer, ka3hdo@amsat.org
Mark Steiner, k3ms@amsat.org

ARISS Objectives



Spark Student's Interest
In Science & Technology



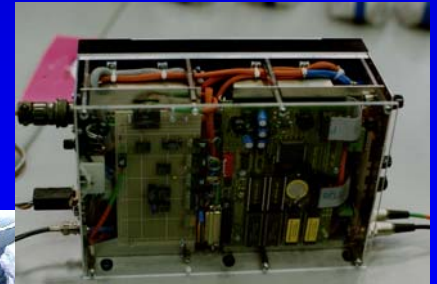
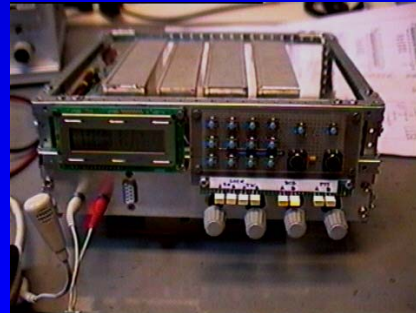
Crew Family Contacts
(Crew Psychological Ops)



Promote Interest
In Amateur Radio



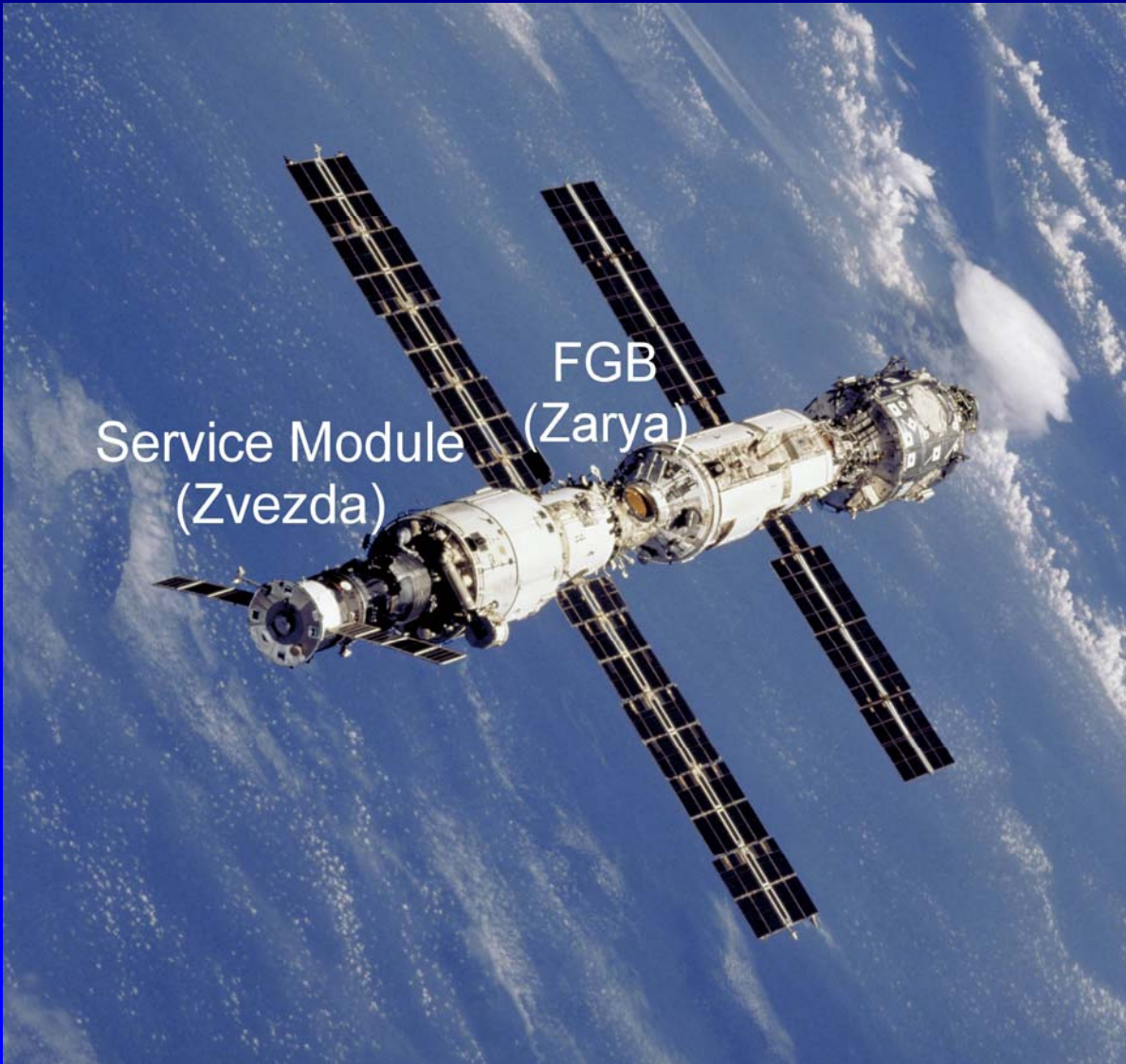
Human Spaceflight
Awareness



Mir SSTV
Dec 12 99 17:29 UTC Rec W8ZCF

Experimentation

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

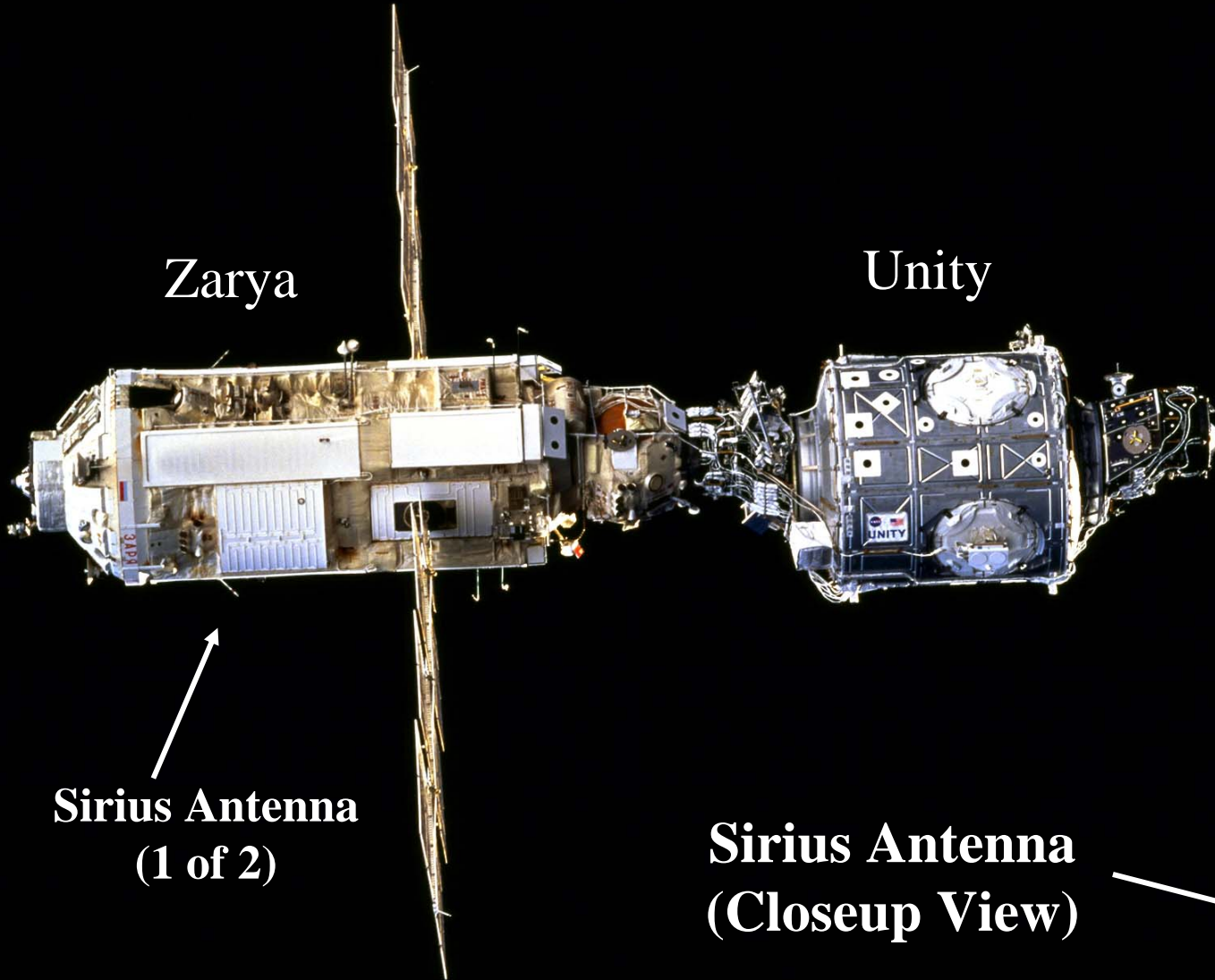
SIRIUS ANTENNA LOCATION ON ZARYA

Zarya

Unity

Sirius Antenna
(1 of 2)

Sirius Antenna
(Closeup View)

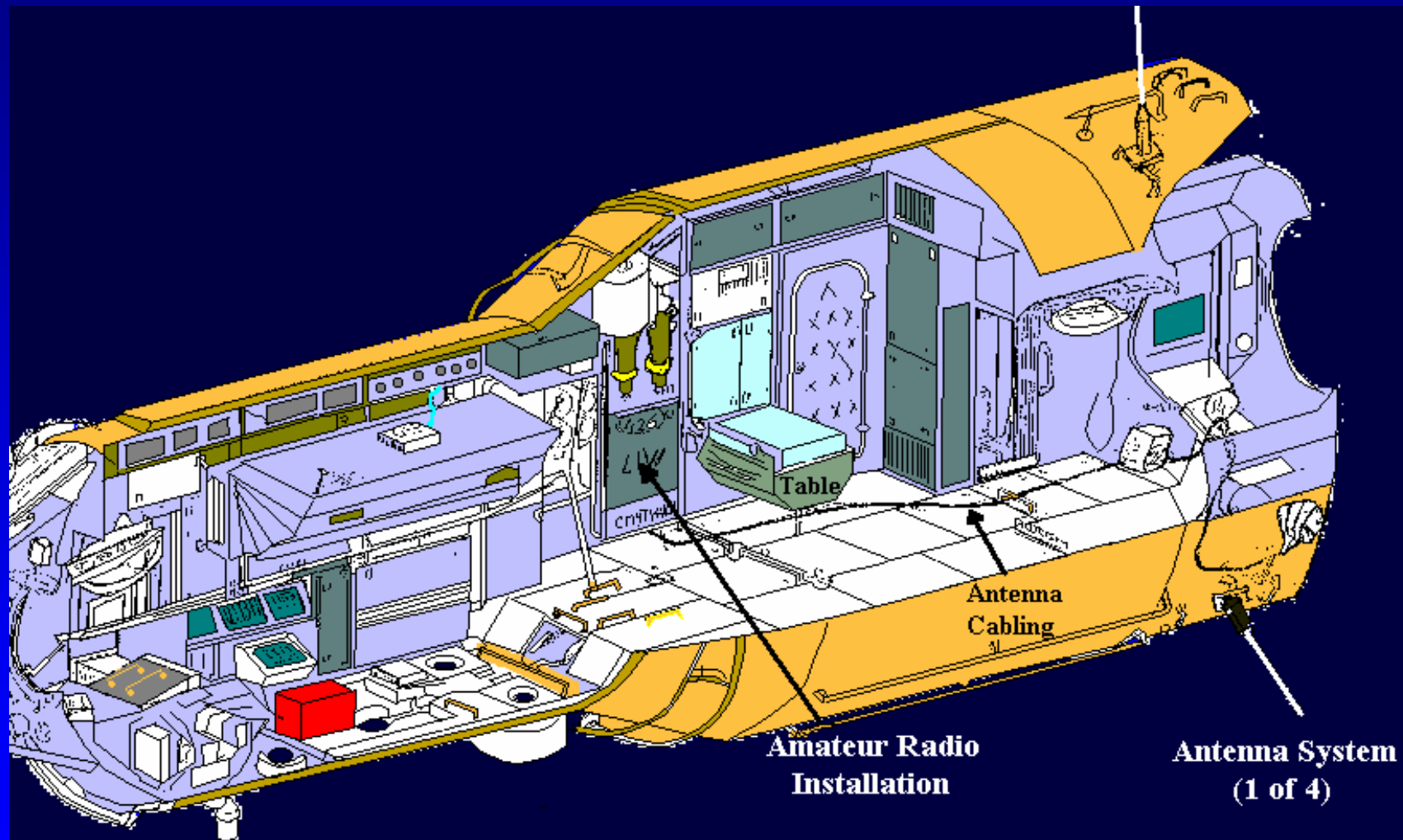


On-Orbit View of ISS (STS-112)



ARISS / ISS HAM

Location in and on the Service Module



Antenna System w/ VHF/UHF Antenna Installed

(1 of 4)

Internationally Developed

Italian Contribution:

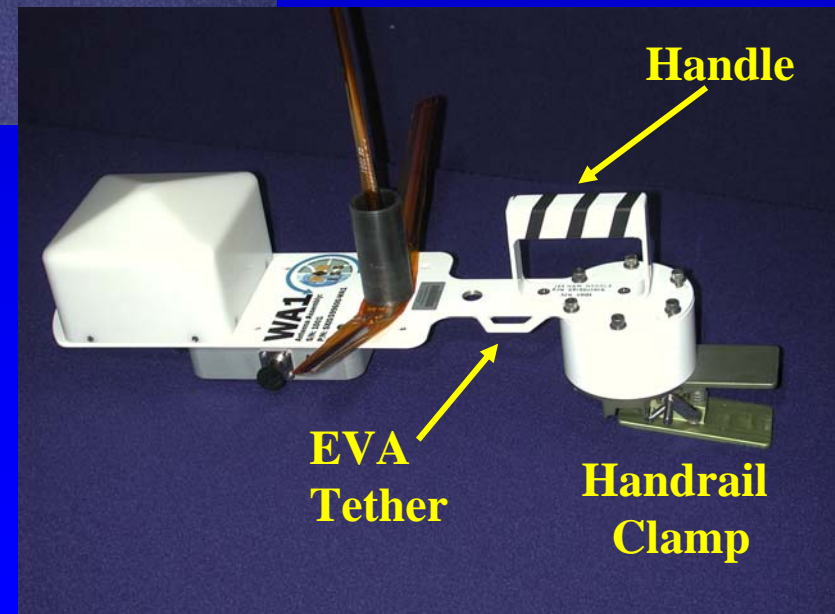
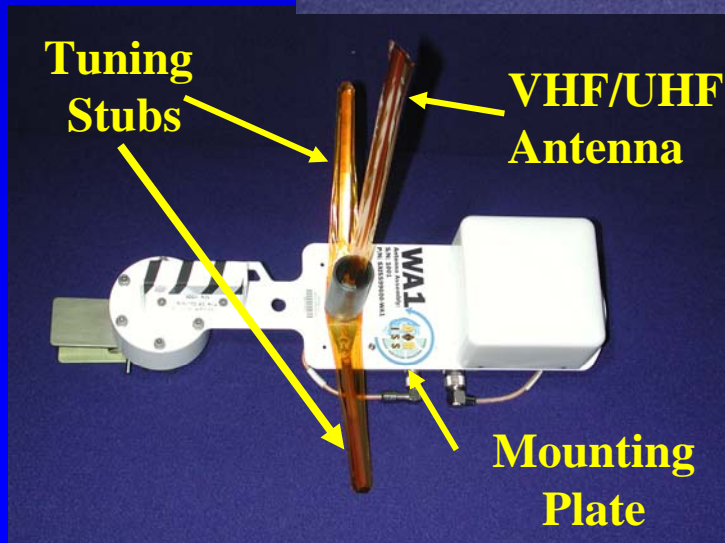
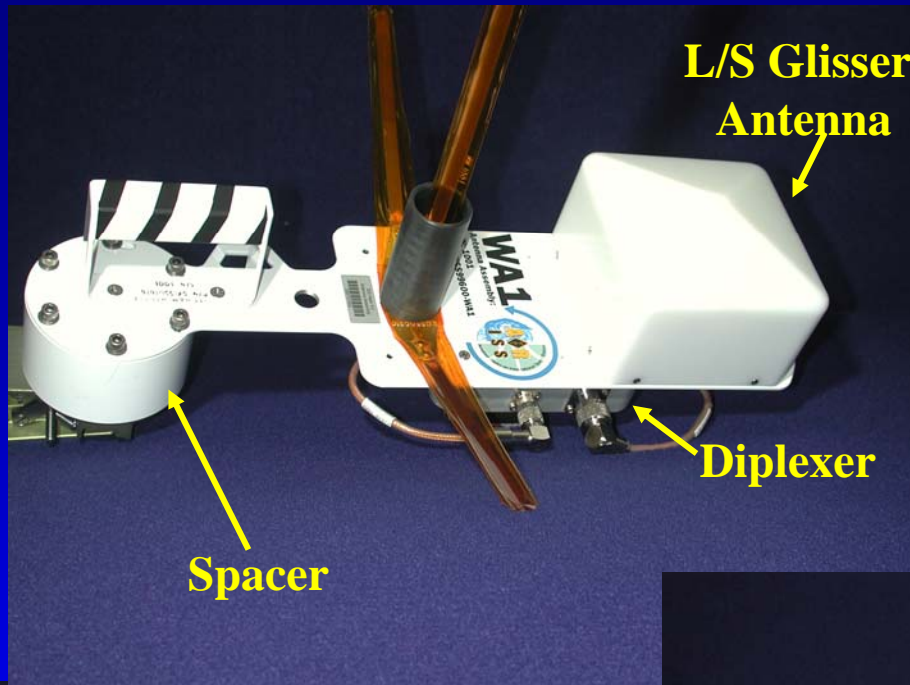
Microwave Antennas
Diplexer

US Contribution:

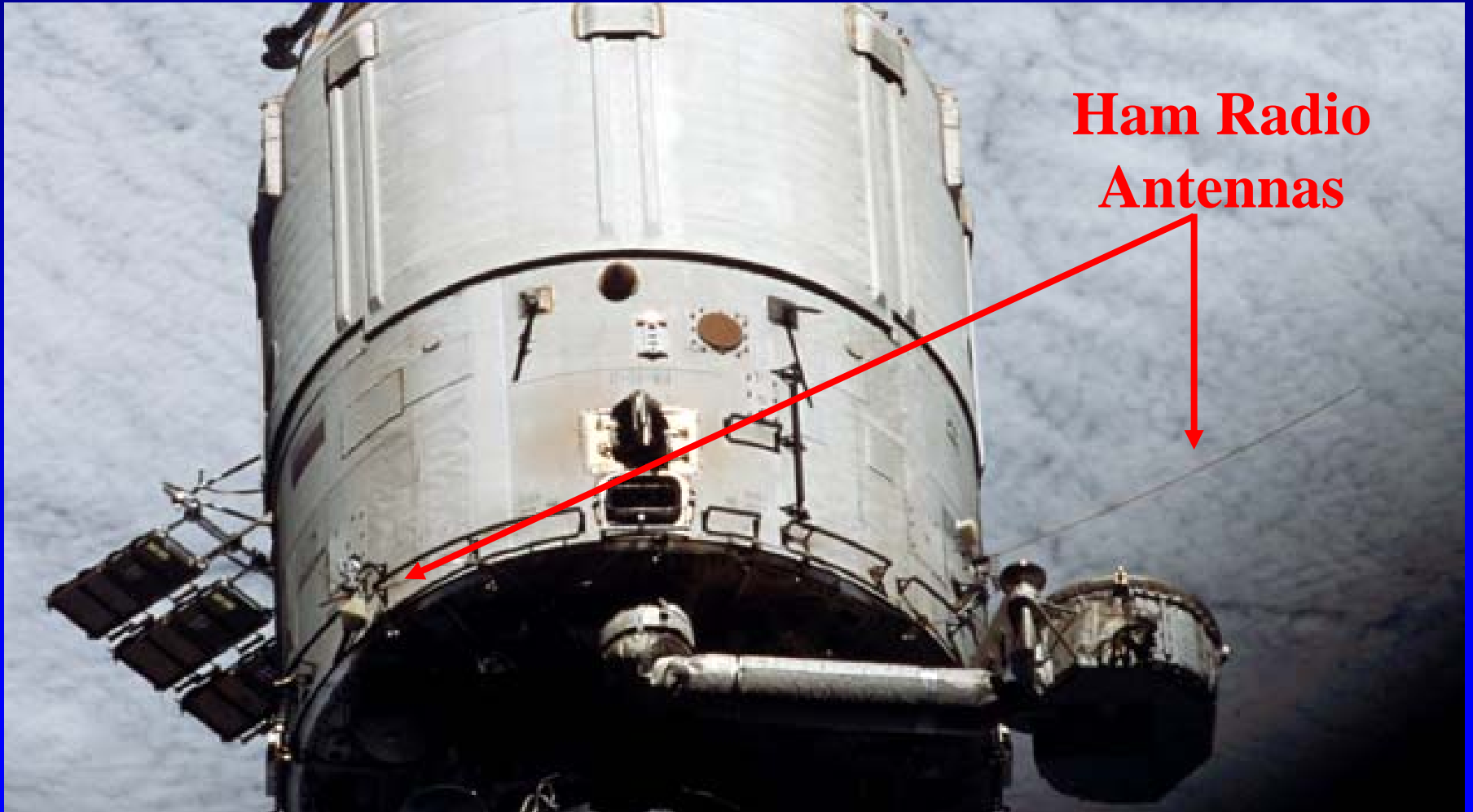
Mounting Plate
Handle & Spacer
VHF/UHF & HF Antennas

Russian Contribution:

Handrail Clamp
Interconnecting Cables



WA3 and WA4 Antennas on Service Module



Ham Radio
Antennas

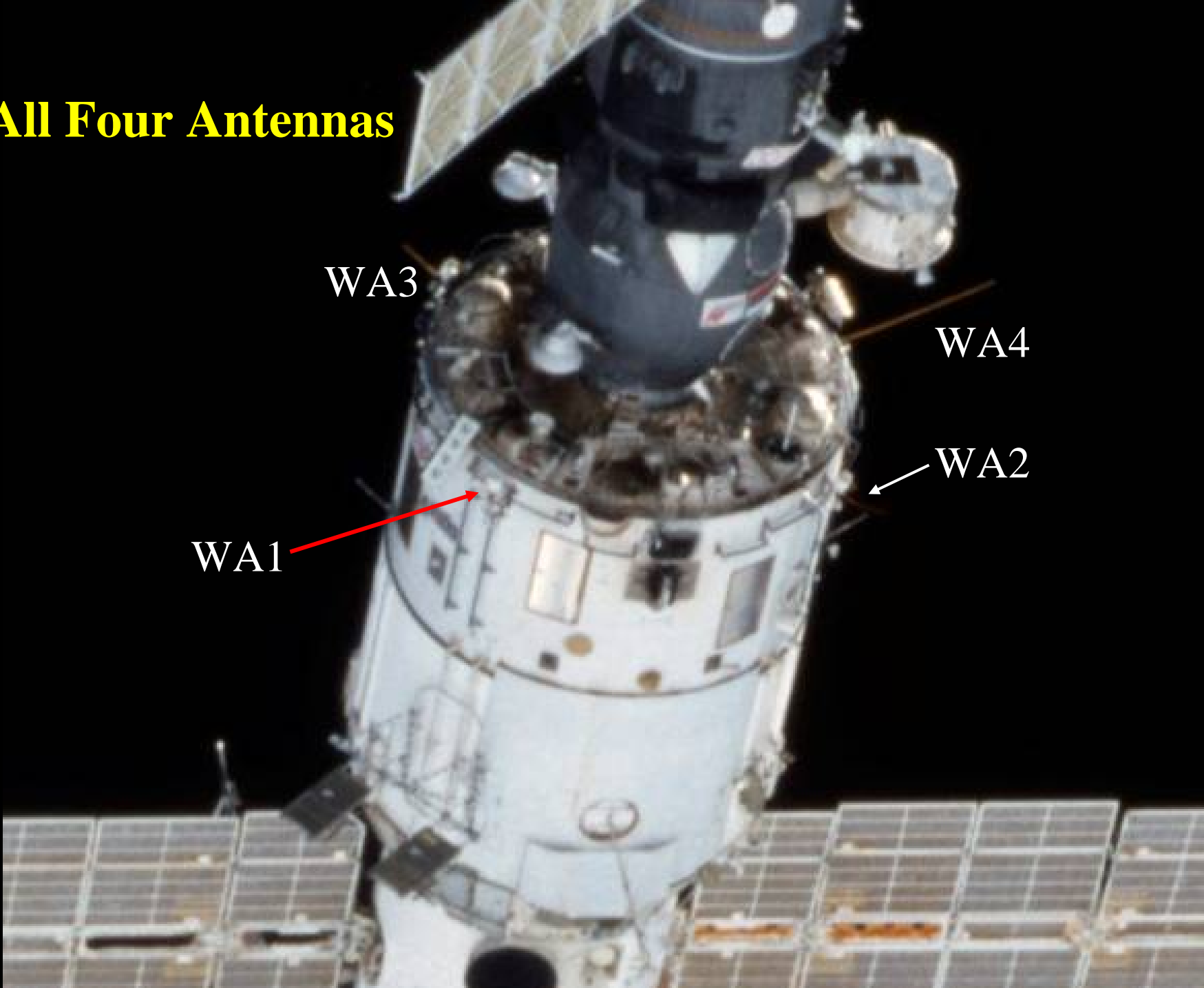
All Four Antennas

WA3

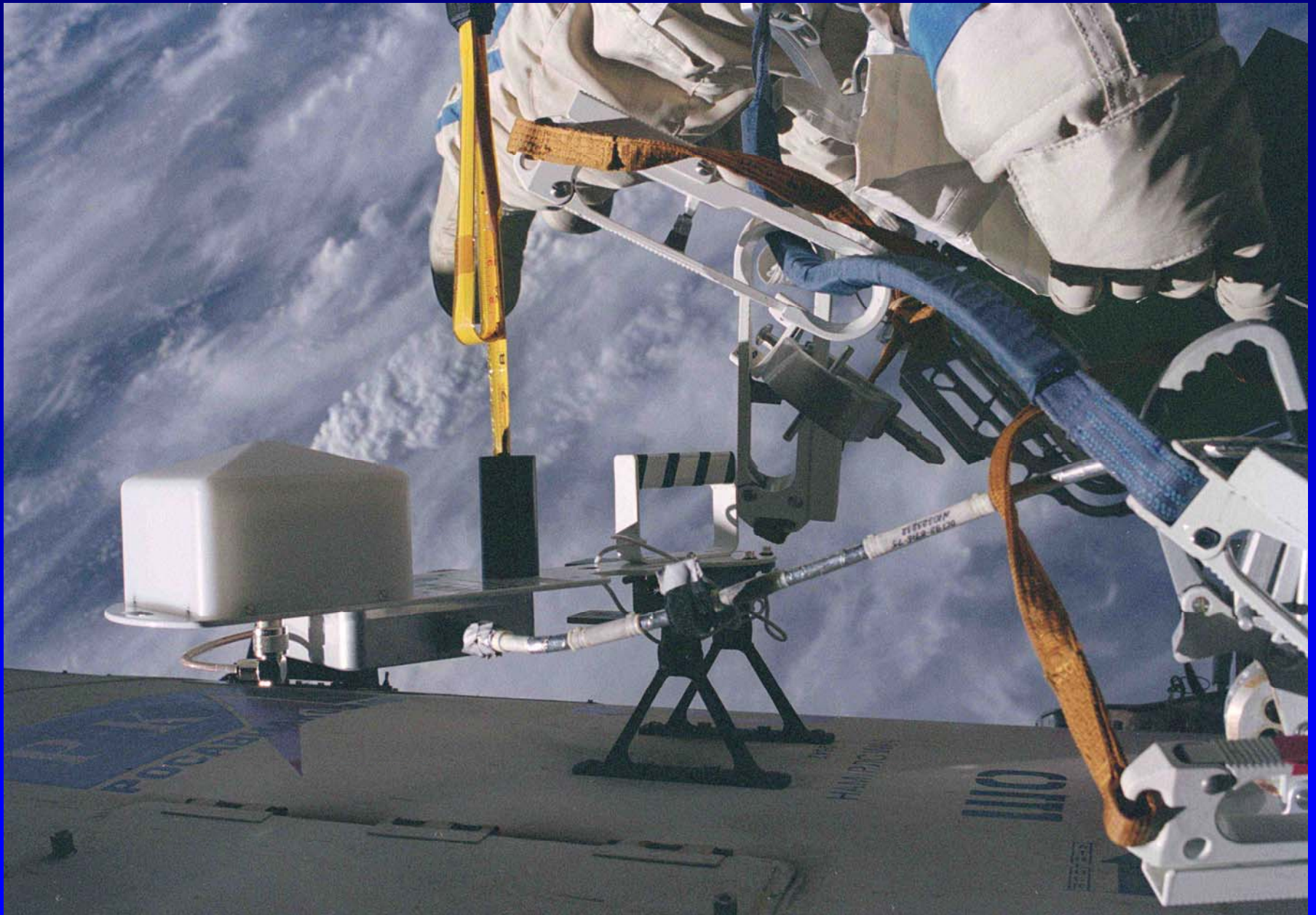
WA4

WA2

WA1



WA4 (HF) Antenna during EVA



10 ISS Expeditions Completed

4.5 Years continuous ARISS operations



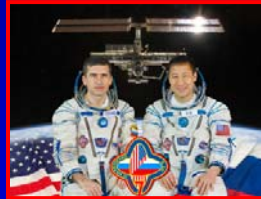
Nov 2000 – Mar 2001



Nov 2002 – Mar 2003



Mar 2001 – Aug 2001



Apr 2003 – Oct 2003



Aug 2001 – Dec 2001



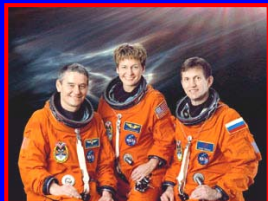
Oct 2003 – Apr 2004



Dec 2001 – June 2002



Apr 2004 – Oct 2004



June 2002 – Nov 2002



Oct 2004 – Apr 2005

Expedition 11



Sergei
Krikalev
U5MIR

John
Phillips
KE5DRY

Operations

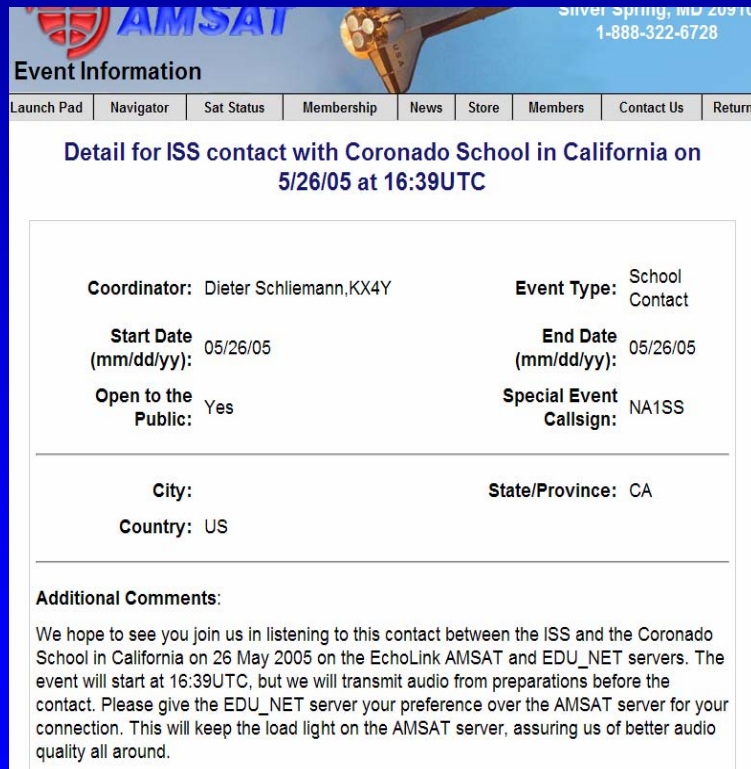
- Downlink:
 - Worldwide both voice & packet: 145.80
- Uplink:
 - Packet: 145.99
 - Region 1 voice: 145.20
 - Region 2 & 3 voice: 144.49
 - Voice Repeater: 437.80
- Callsigns:
 - DL0ISS
 - RS0ISS
 - NA1SS
- Crew Schedule
 - ~0700 to 1900 UTC
 - Off Saturday Noon to Sunday evening

Voice Over Internet Protocol (VOIP)

IRLP, Echolink and Internet Streaming Provides a Wider Reach to Schools and Hams Around the World

Echolink

AMSAT and EDU_NET Servers



AMSAT Silver Spring, MD 20910 1-888-322-6728

Event Information

Launch Pad | Navigator | Sat Status | Membership | News | Store | Members | Contact Us | Return

Detail for ISS contact with Coronado School in California on 5/26/05 at 16:39UTC

Coordinator: Dieter Schliemann, KX4Y	Event Type: School Contact
Start Date (mm/dd/yy): 05/26/05	End Date (mm/dd/yy): 05/26/05
Open to the Public: Yes	Special Event Callsign: NA1SS
City:	State/Province: CA
Country: US	

Additional Comments:

We hope to see you join us in listening to this contact between the ISS and the Coronado School in California on 26 May 2005 on the EchoLink AMSAT and EDU_NET servers. The event will start at 16:39UTC, but we will transmit audio from preparations before the contact. Please give the EDU_NET server your preference over the AMSAT server for your connection. This will keep the load light on the AMSAT server, assuring us of better audio quality all around.

www.amsat.org
Calendar of Events

IRLP

9010 "Discovery" Reflector



New Tab IRLP Reflector 9010 Discovery

IRLP REFLECTOR 9010 DISCOVERY

Thursday, May 26, 2005

Time of connection to Reflector: 1625 UTC (approximately)

Participating School: Coronado Village School

Village Elementary School

Location: Coronado, California, USA

Time of School Contact with ISS: 1639 UTC (approximately)

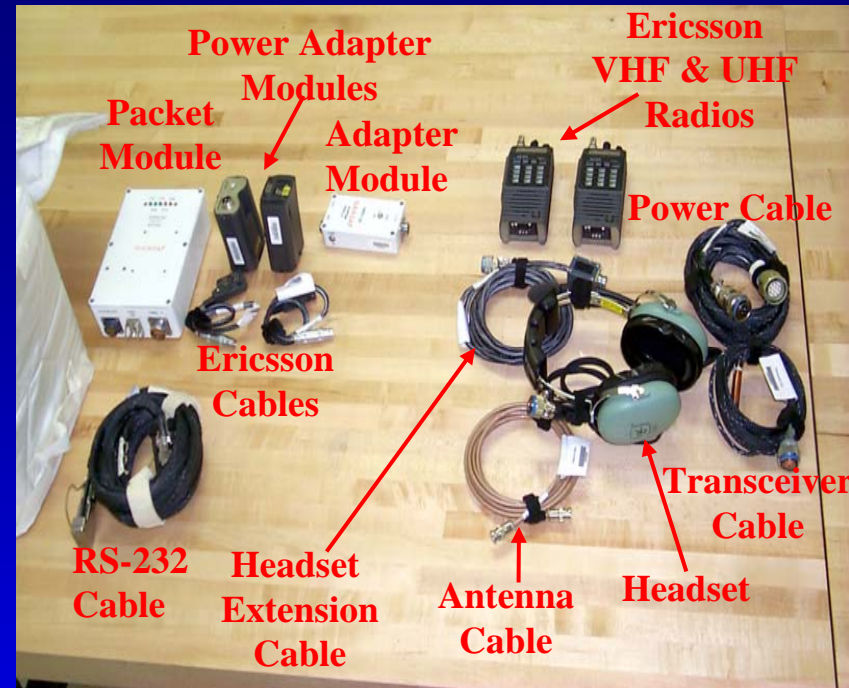
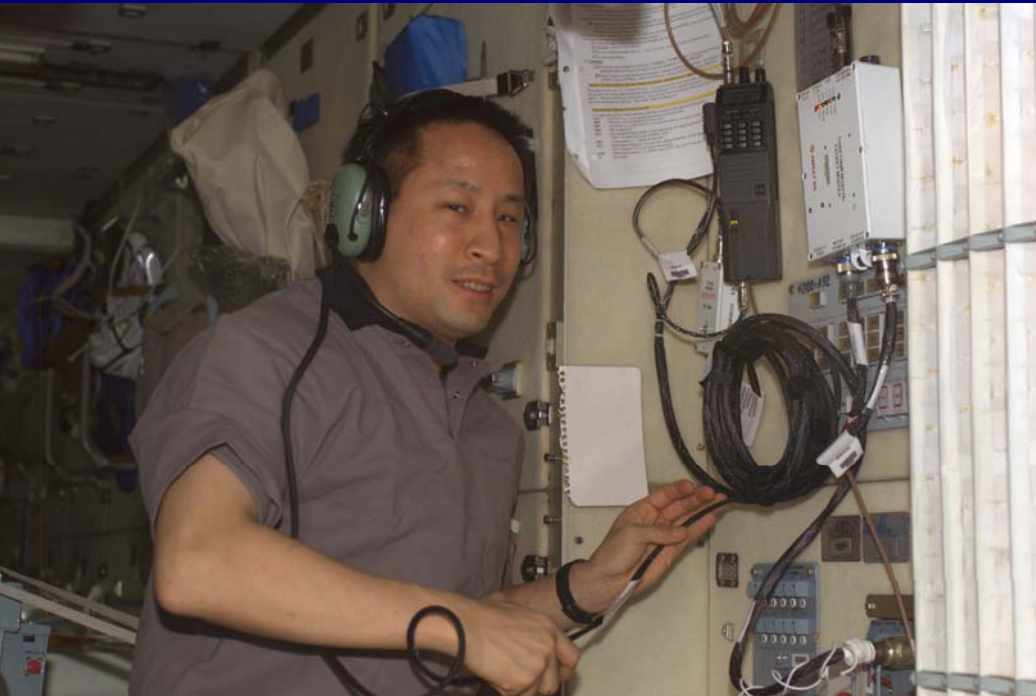
Home
News
Events
Sites
Listen
Contacts

NASA CSA ASC
AMSAT ISS

A R R
I

www.discoveryreflector.ca

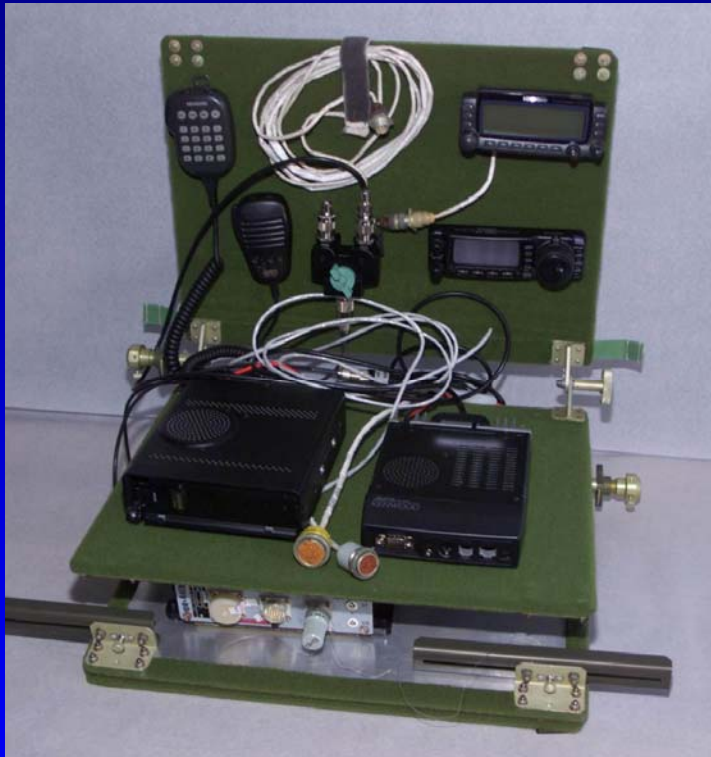
Phase 1 (SAREX) Hardware Status



- **Ericsson 2 meter radio operational on voice in FGB**
 - *“Best uplink audio on ISS”* Bill Shepherd, November 2000
- **Packet Module non-operational**
 - Needs to be reset by the crew
- **Ericsson 70-cm radio awaiting installation in Service Module**
- **Preparing replacement headset and extension cable for launch on Shuttle**
 - Extension cable on STS-114 Shuttle Return to Flight

Service Module

Current and Planned Capabilities



- Phase 1 UHF System
- Higher power (25 W) VHF & UHF FM Radio System
- HF radio system for ionospheric experimentation—early 2006
- Packet Radio
- SSTV—fall 2005

*Supports Multi-Band, Multi Operator
Autonomous and Crew-tended Modes*

Phase 2 Hardware Status

- Kenwood D700 & WA2 Antenna System Operational on 2 meters and 70 cm
 - General voice QSOs
 - Packet
 - Repeater operations
 - School group operations



Planned ISS Hardware Deployments

- 1st External payload, MISSE-5/PCSAT2—STS-114 *On Orbit!*
- SSTV/Spacecam—Progress 19P Fall 2005
- Phase 2 Yaesu hardware—Early 2006



Yaesu FT-100



SSTV Software



MISSE-5/PCSAT2

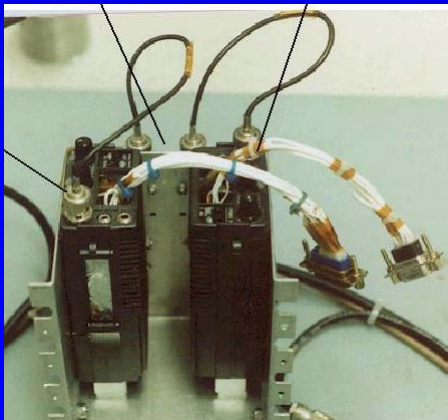
- Packet
- Repeater
- PSK31

Future Capabilities



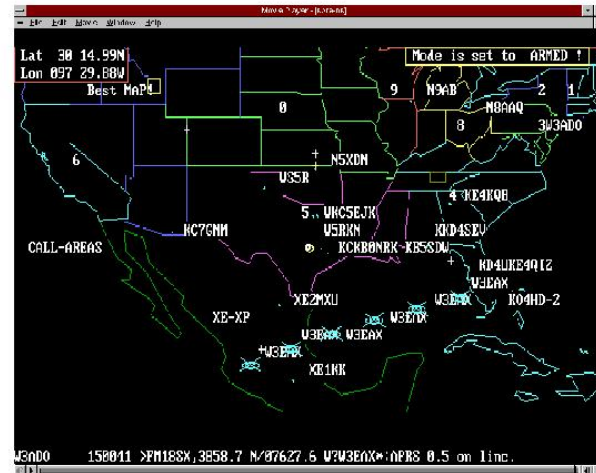
Amateur TV

(Standard, Spread spectrum, & MPEG)



**Express Pallet &
External Payloads---**
**w/ antennas &
student experiments**

SPRE Pass Over U.S.



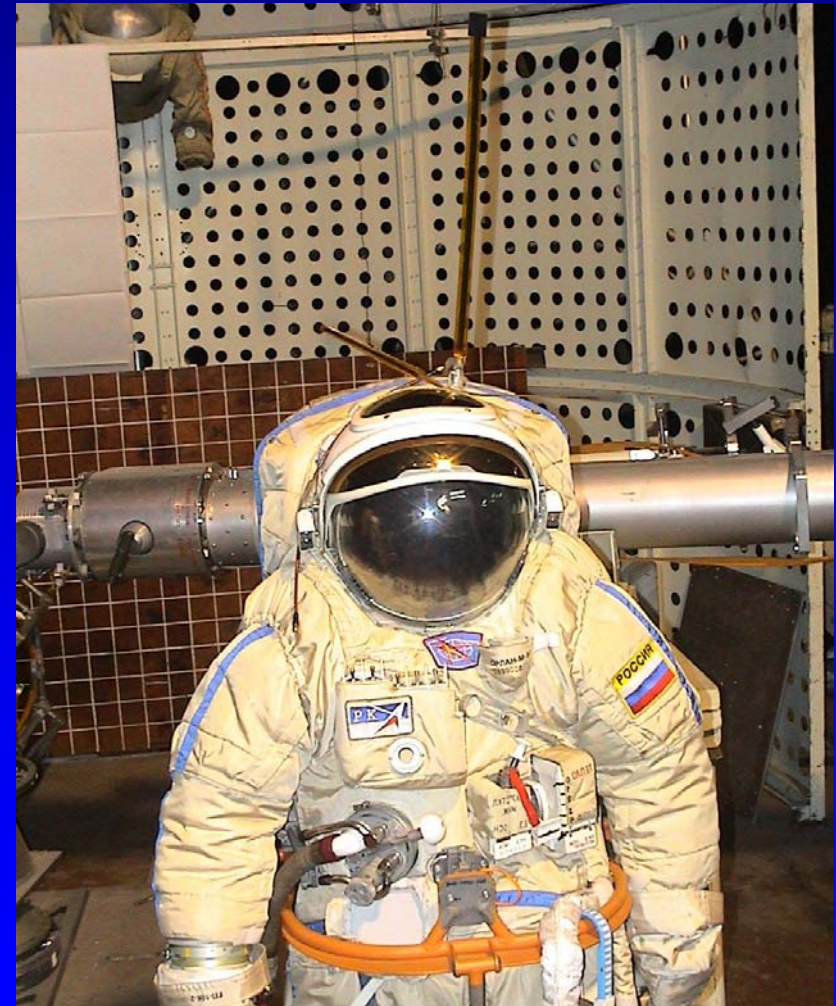
**R/T Internet TLM
using amateur radio**

*PCSAT-2
On-board
STS-114!!*

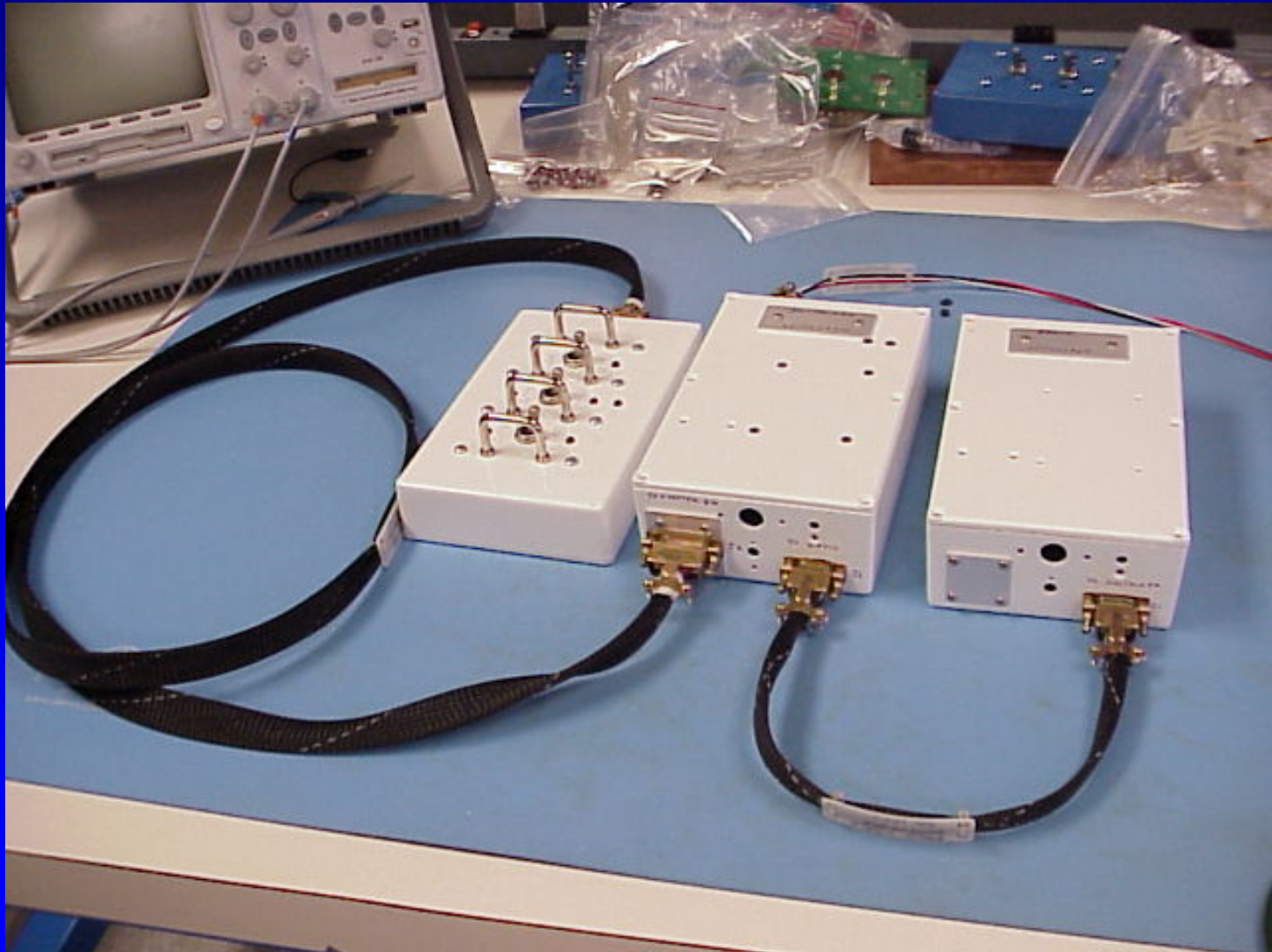
*SUITSAT
In Sept/Oct!!*

SuitSat--Amateur Radio Extra Vehicular Activity (EVA) In a Space Suit

- Russian-led initiative w/ USA Support
- Capabilities:
 - International Student Message Downlink
 - SSTV Picture
 - Telemetry
 - School Spacewalk—DVD with school name, artwork and student names included
- Expected deployment: Sept/Oct 2005
- 145.99 MHz downlink



Suitsat Flight Hardware System



Suitsat Control Box

CONTROL BOX
БЛОК УПРАВЛЕНИЯ

P/N SUITX05930
S/N 001

ON
ВКЛ

OFF
ВЫК

POWER
ПИТАНИЕ

TIMER 1
ТАЙМЕР 1

TIMER 2
ТАЙМЕР 2

SAFE
СТУПЕНЬ

POWER 12V

POWER
28V

T1
COUNTING

T2
ENABLED

OFF

SAFE

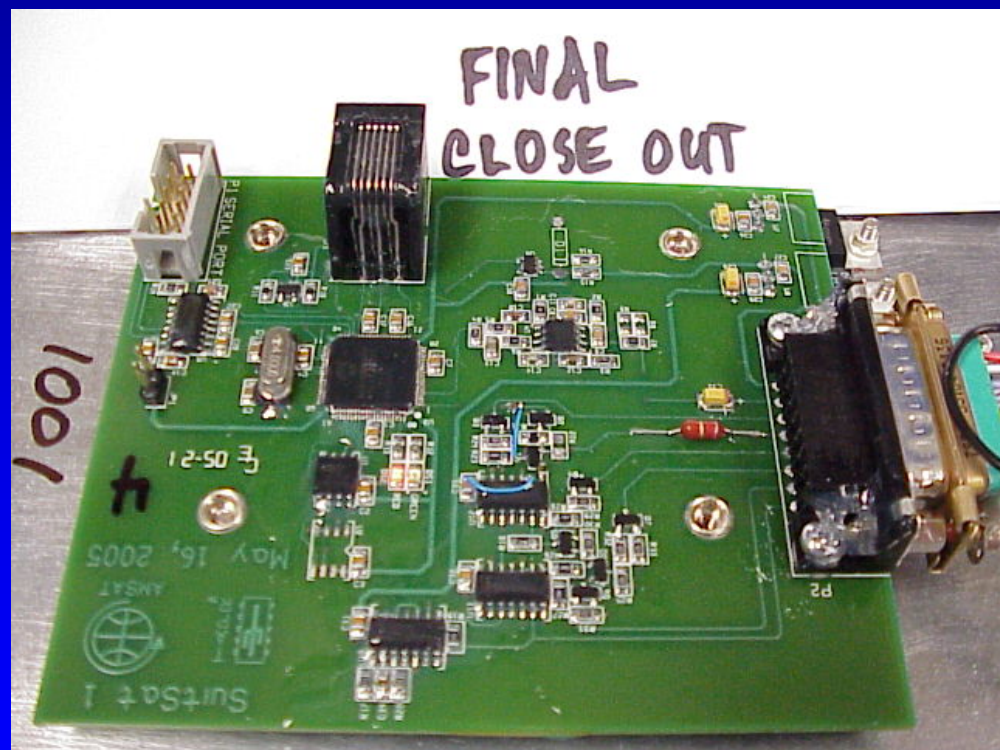
SAFE



Radio Box



Digitalker Box



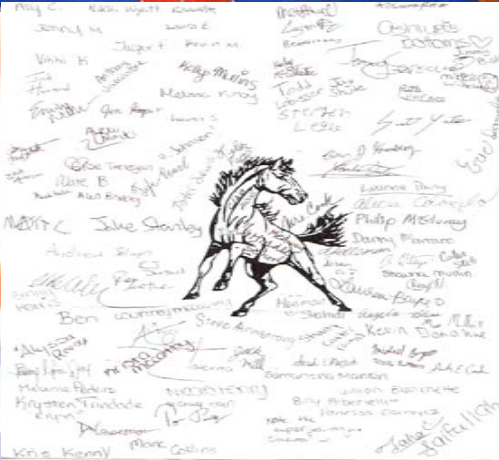
Suitsat Crew Training



Suitsat Downlink

- Sequence:
 - Suitsat voice ID
 - International voice message, Suit Telemetry (Voice), or SSTV Image
 - 30 second pause
- Telemetry Voice Downlink
 - Mission Time
 - Suit Temperature
 - Battery Voltage
- International Messages in Russian, English, French (Canada), Spanish, German and Japanese

SuitSat School Spacewalk Pictures, Artwork and Signatures from Students around the world



flowerswatercolor!
Linda Winder student at
Art Academy of Cincinnati

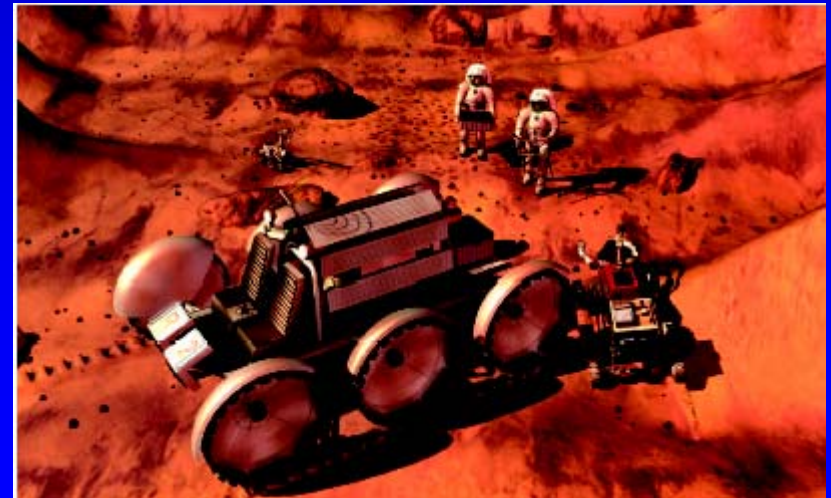
Kamishirane Elementary School, Yokohama Japan



みんがスマイル 30年の思いを胸にキラッと輝く上白根っ子
横浜市立上白根小学校 創立 30 周年記念

The Future

- On January 14, 2004, US President Bush proclaimed a new exploration initiative for NASA---go to the Moon by 2020, Mars next and beyond Mars later
- ARISS team developing Exploration Initiative strategy
- ARISS's solid performance and outstanding international teamwork is recognized and respected by the Space Agencies
- The challenges will be high due to the long path lengths



Exploration Initiative Plans

- Safely return the Shuttle to flight operations, with retirement of Space Shuttle around 2010
- Continue to meet international commitments on ISS development and operations
 - Complete ISS construction
 - Utilize the ISS as an engineering and science testbed to further goals of Exploration
- Lunar robotic missions starting in 2008-2009
- Lunar human exploration missions starting in the 2015-2020 timeframe
- Mars human exploration missions when ready
- This is a journey, not a race

Conclusions

- Multi-mode, multi operations capability is now a reality on ISS
- Payload provides an outstanding Educational Outreach foundation for ISS
- ARISS's solid performance and outstanding international teamwork is recognized and respected by the Space Agencies
- We are now positioned to venture beyond Earth orbit—are you prepared to help?



Frank Culbertson During Scout Jamboree on the Air

ARISS Information

<http://www.rac.ca/ariss>

