

Here and Back Again: Space Communications

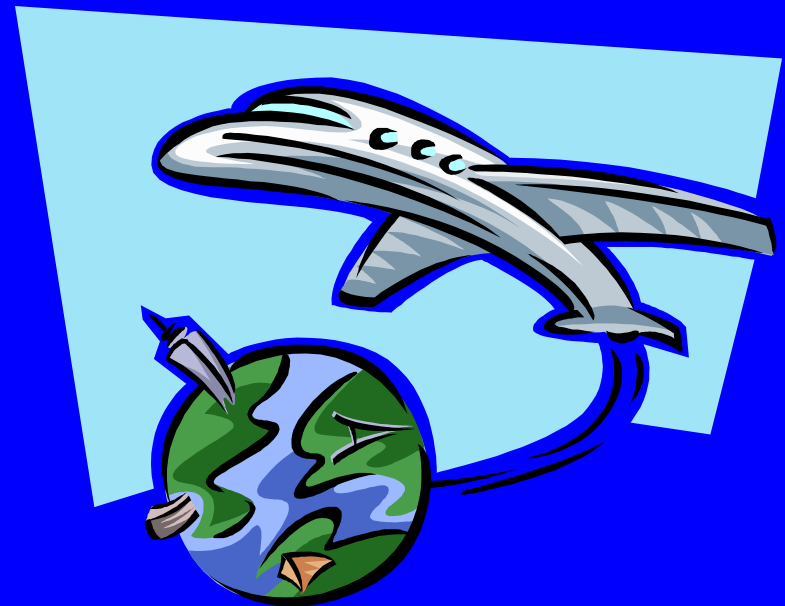
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IT Undergraduate Education, GMU

KD6DSH

and

Will Marchant, CHIPSat Project, UC
Berkeley, Space Sciences Lab

KC6ROL



So How Do You Plan for a Career in Telecommunications?

One path is to pursue a college degree in an Engineering field:

- Information Technology
- Computer Science
- Applied Engineering Statistics

- Computer Engineering
- Electrical Engineering.
- Systems Engineering

For programs at GMU:

<http://ite.gmu.edu>

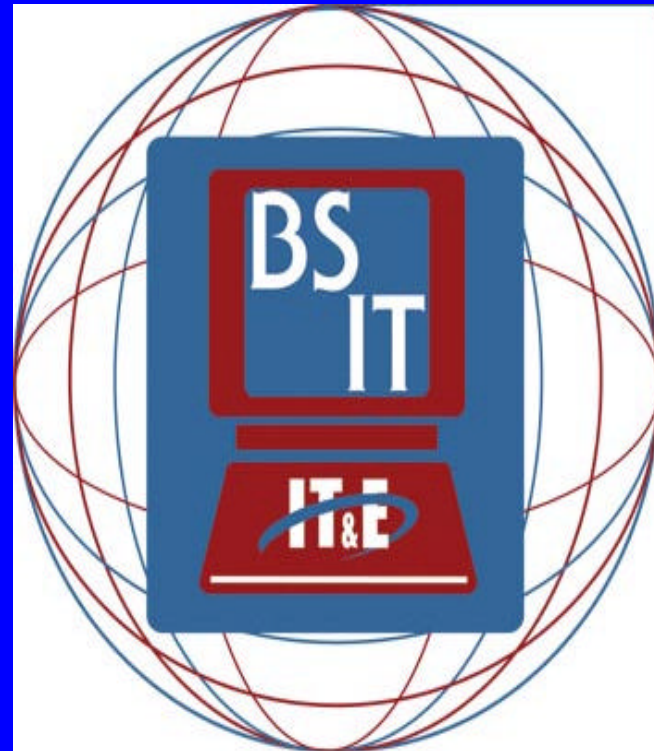


So How Do You Plan for a Career in Telecommunications?

- We have a new college major that may appeal to girls and young women: the BSIT
- The BSIT prepares students for such careers as web site design and computer networking, but also includes coursework in Telecommunications.

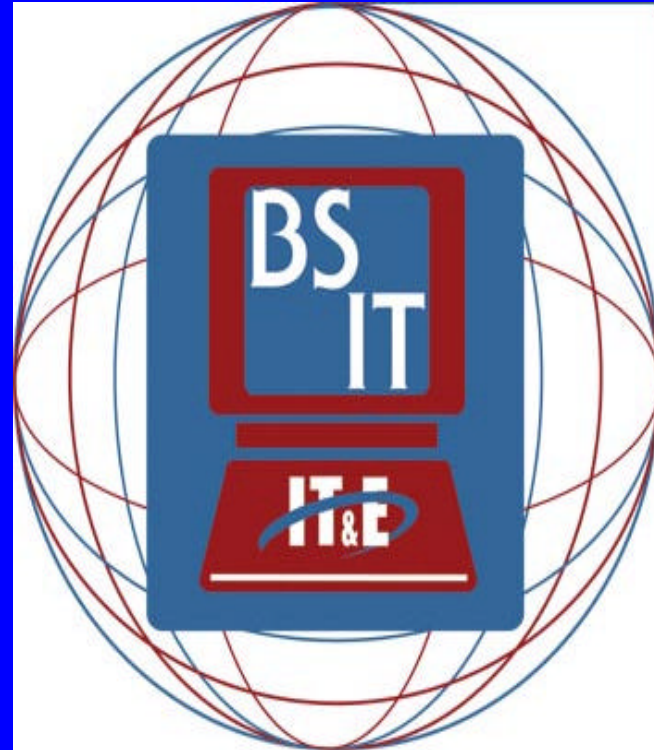
For the BS in IT see:

<http://ite.gmu.edu/bsit>



So How Do You Plan for a Career in Telecommunications?

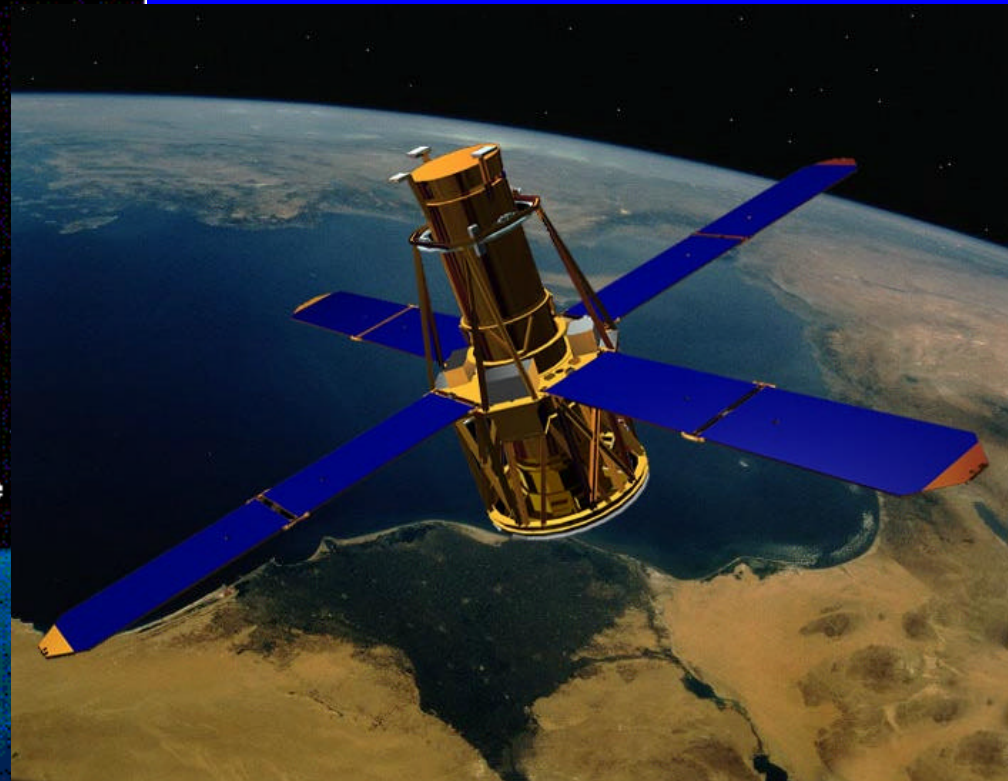
- When you get to High School, try to take as much Math and Natural Science (Chemistry and Physics) as you can. It will really help you out later!
- Computer Programming will also help and is a lot of fun!
- Get your Ham Radio License, join a computer club, or some other technical organization.



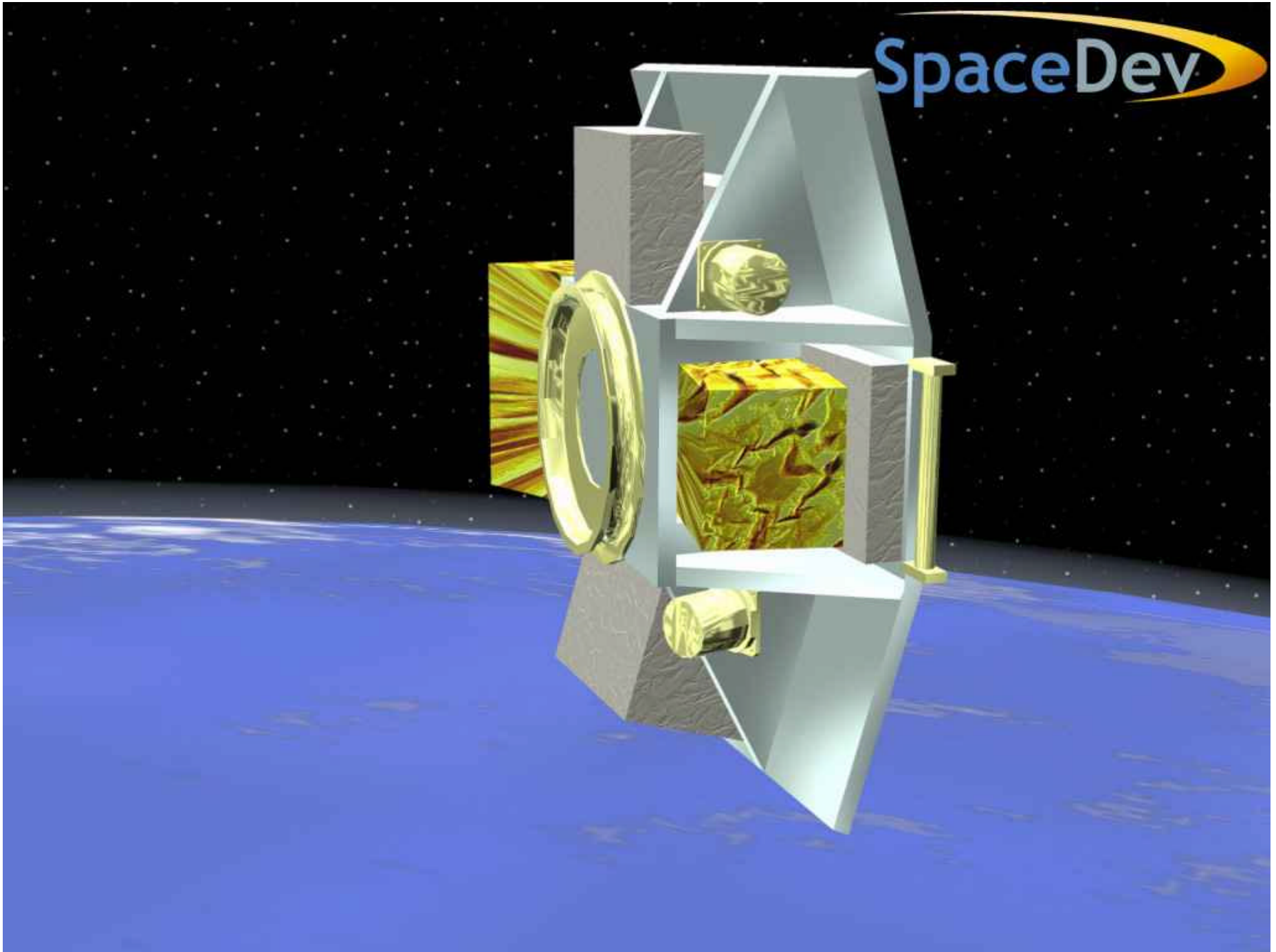
EUVE – 1992 to 2002



HESSI – 2002 to ???



SpaceDev



Different ways of communicating:

- “Land lines”
- Wireless
- High frequency (short wave) long distance radio
- Low Earth Orbit satellites
- High Earth Orbit and Geostationary satellites

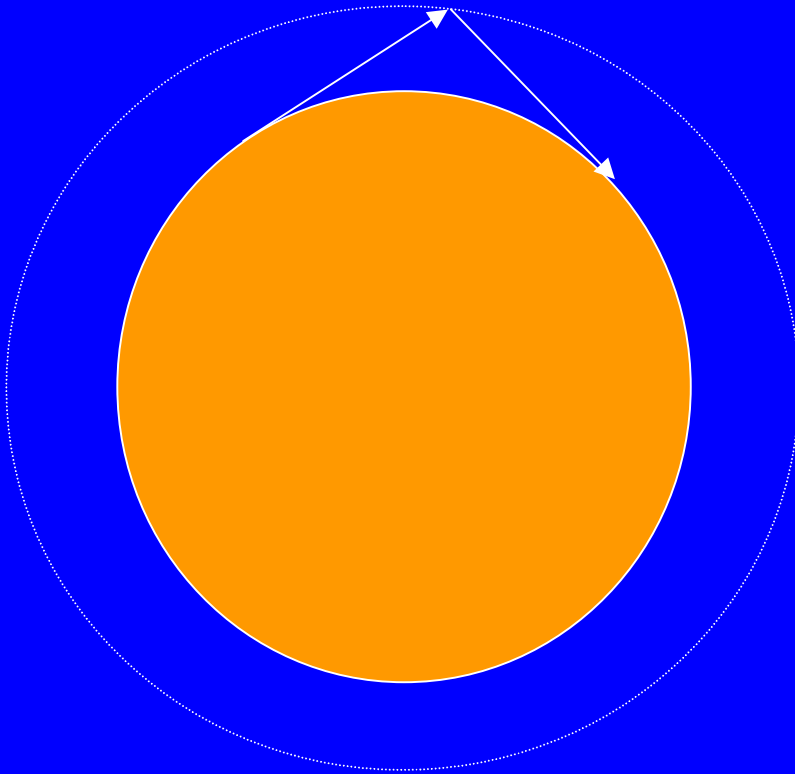
Land lines

- Copper or fiber optic
- Cheap for short distances?
- Installation costs could be high
- Maintenance
- Voice and/or data

Wireless

- Cellphones
- Local Area Networks
- Towers may be cheaper than landlines
- Limited to “line of sight”
- Coverage issues because of terrain
- Voice and data
- Lots of amateur radio opportunities

High frequency (long distance) radio

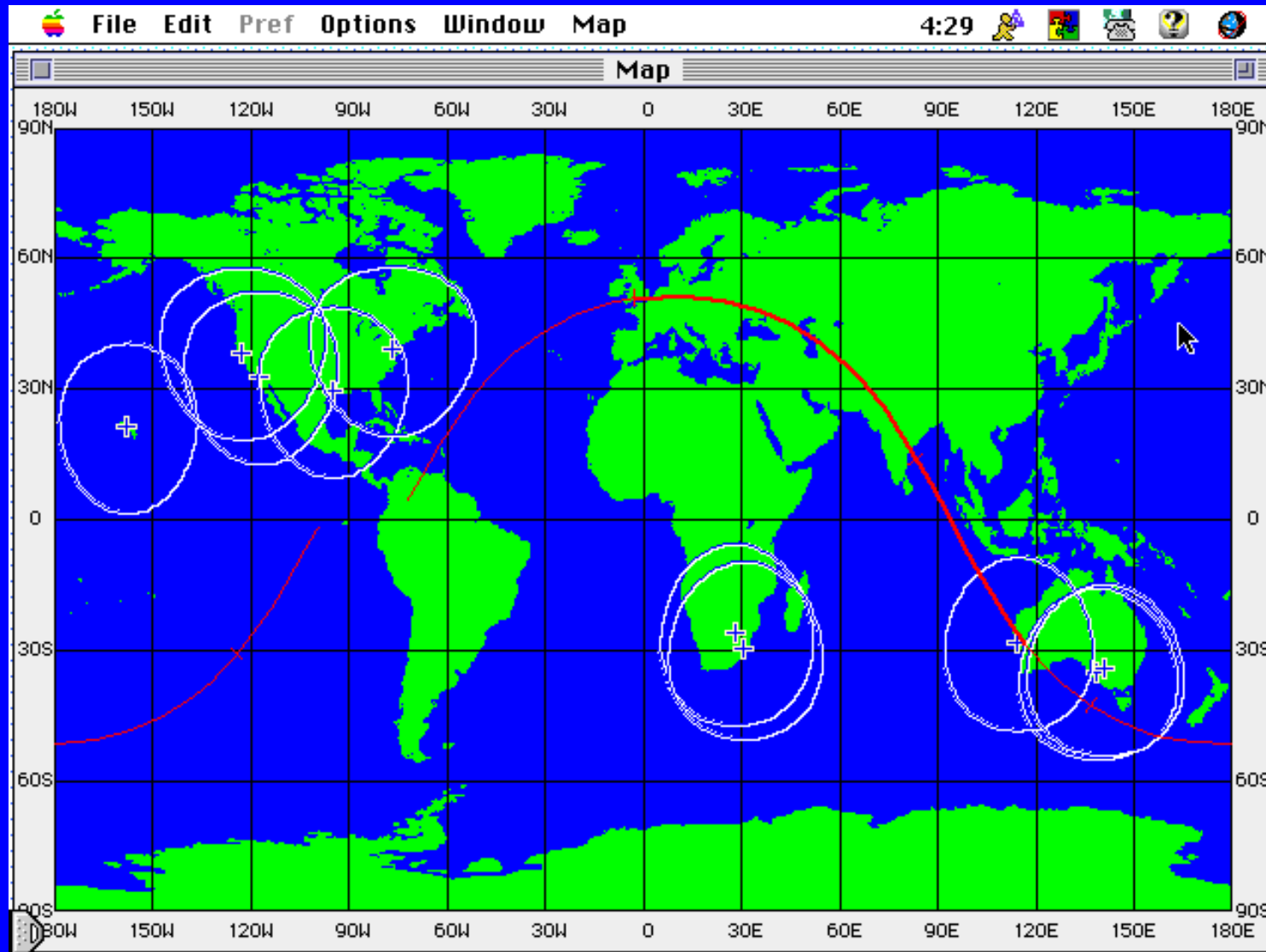


- Intercontinental distances
- Bounces off the ionosphere
- Day/night differences
- Lower frequencies mean lower data rates
- Frequency sharing with intercontinental users
- Lots of hobby usage for both listening and talking

Low Earth Orbit satellites

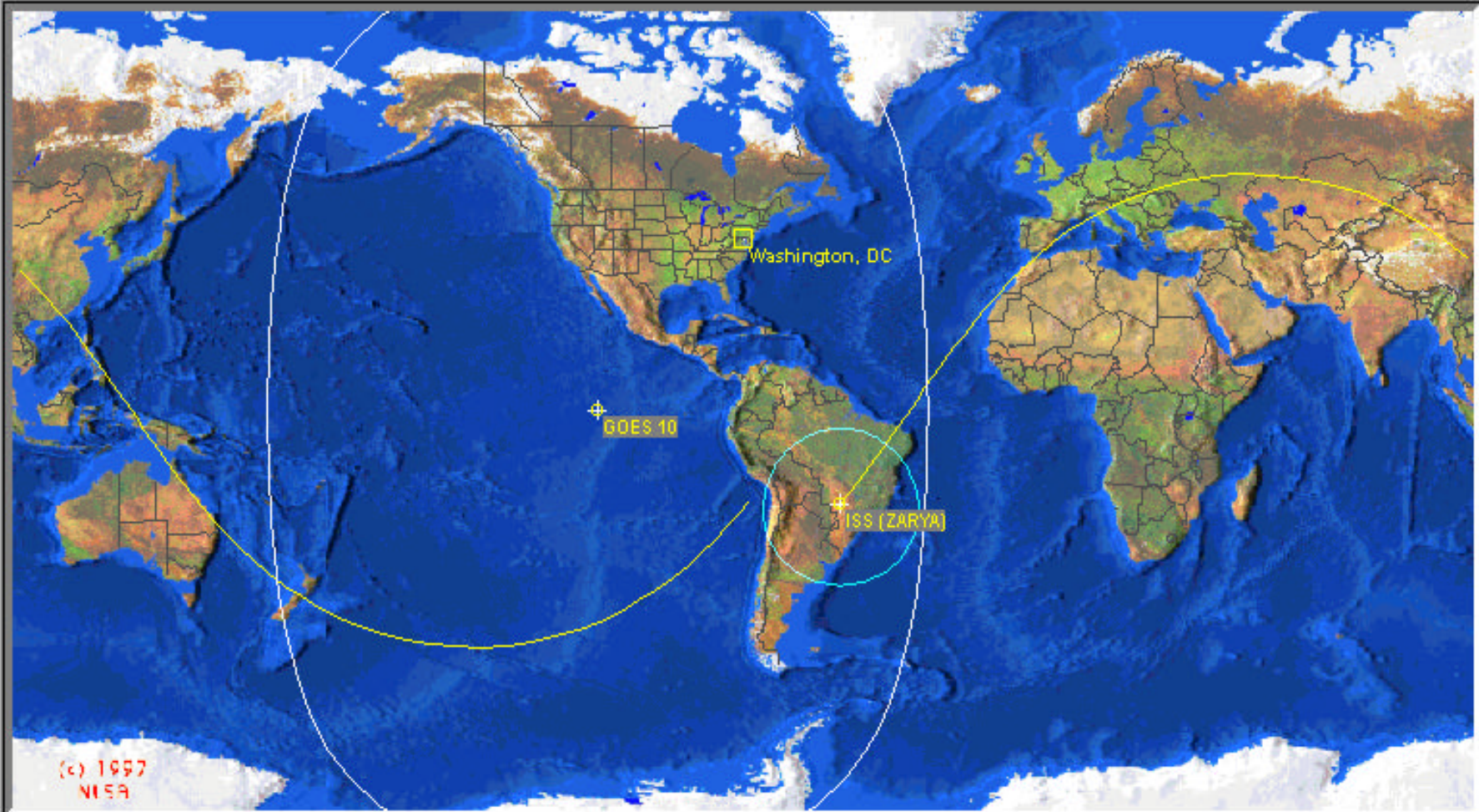
- Usually digital data or digitized voice
- Satellites are typically expensive
- Several hundred mile altitude
- Can see for hundreds/thousand miles
- Limited time availability means gaps or need for many satellites
- Global coverage means frequency and legal issues
- First in 1957, first amateur 1961

Telebridge Network



High Earth Orbit and Geostationary satellites

- Can see further and serve more customers
- But only over a fixed geographic region
- More expensive?
- Greater capacity and lifespan
- Some thought of using optical



Amateur Radio on the ISS

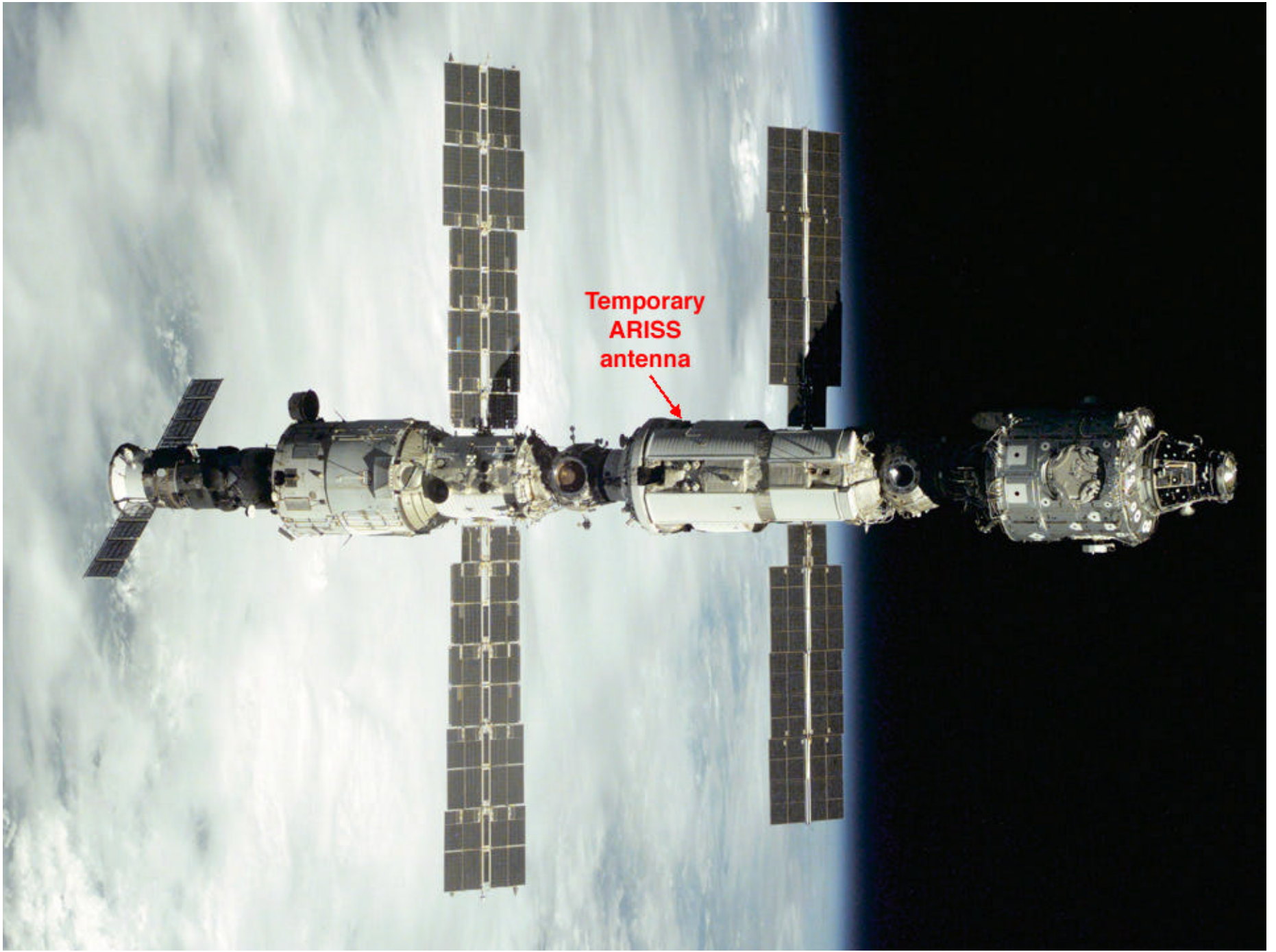


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ISS Expedition One: Oct 2000 to March 2001

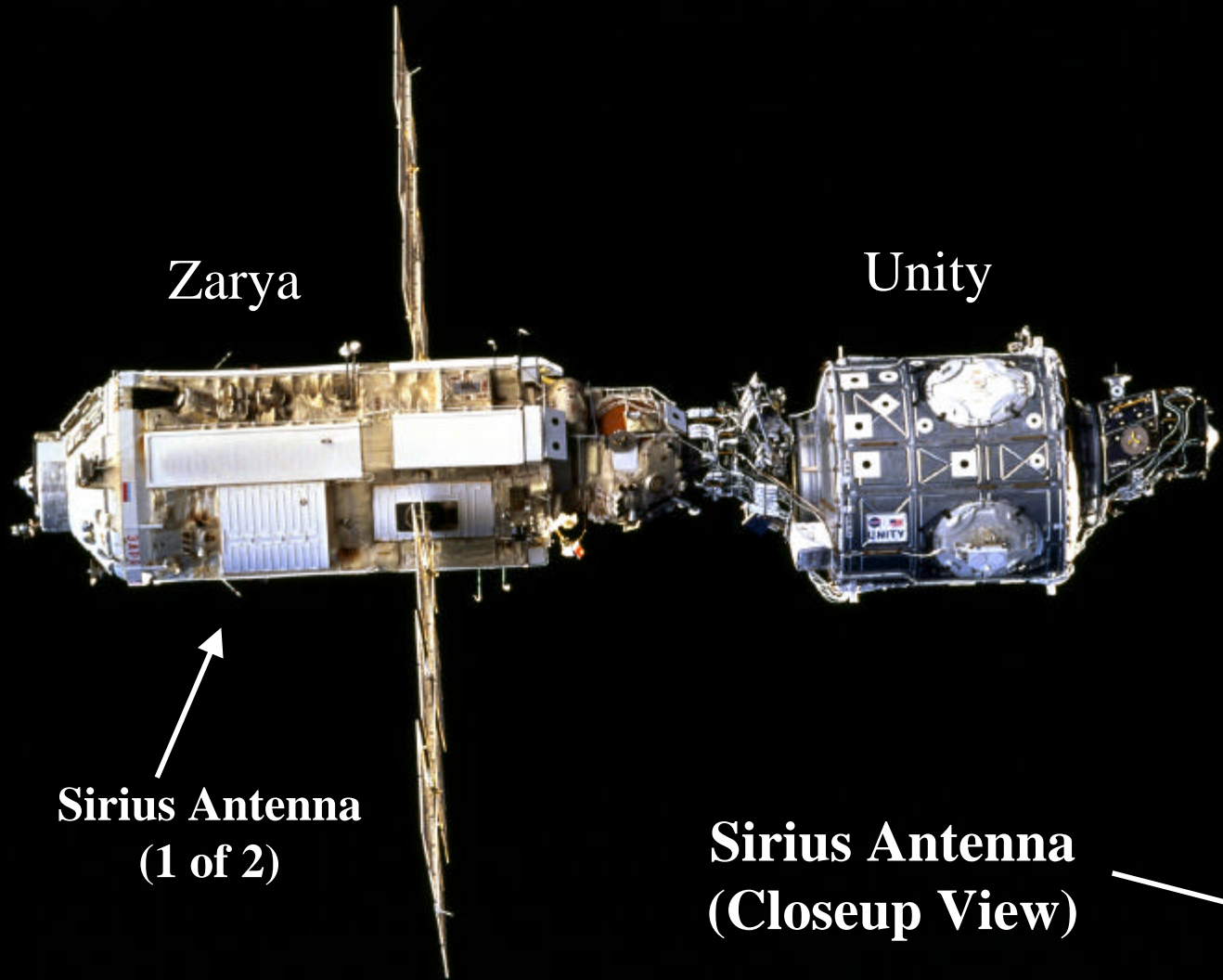


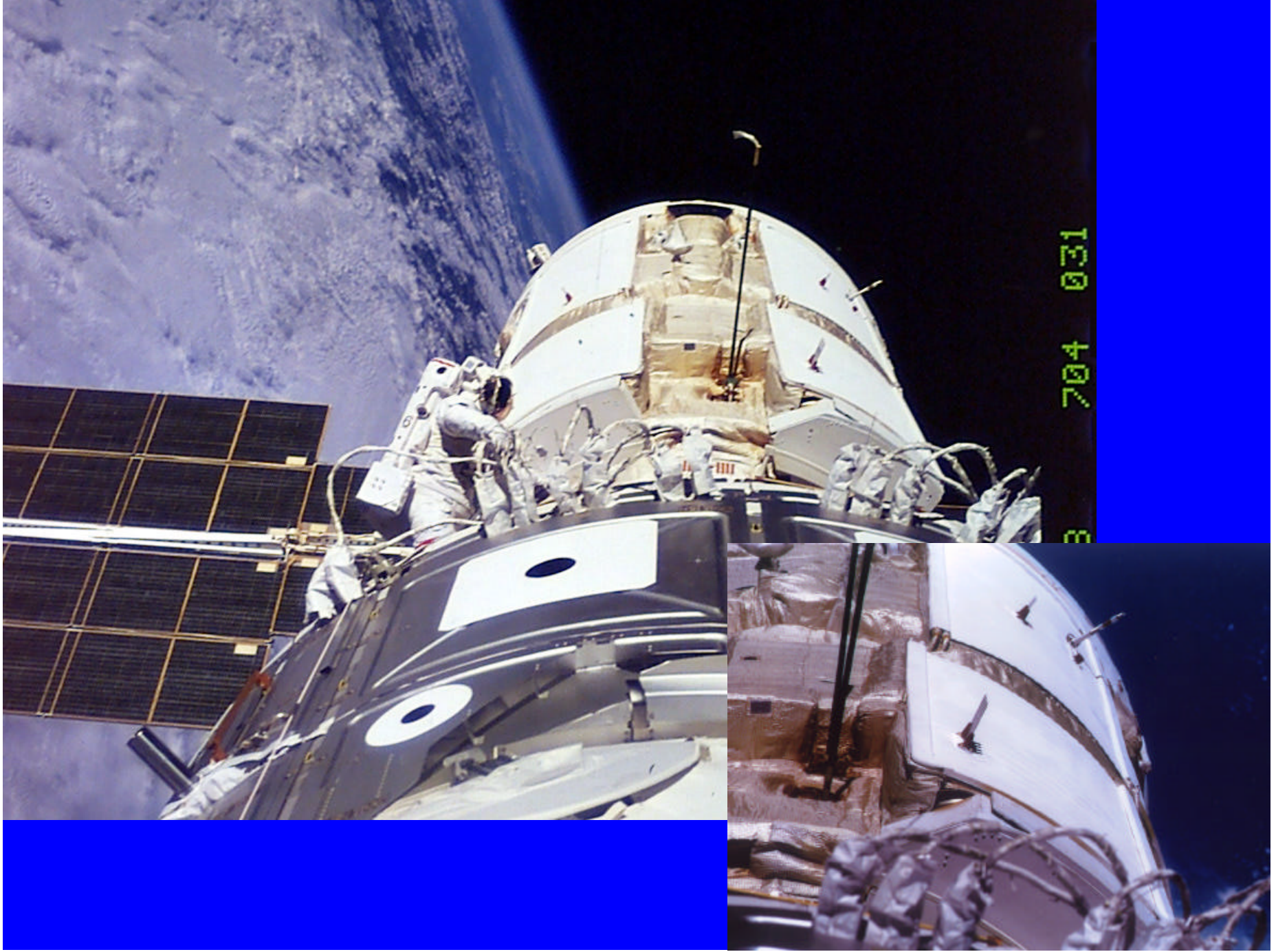
- William Shepherd, KD5GSL
- Yuri Gidzenko, no call
- Sergej Krikalev, U5MIR
- 2m voice commissioned
- Packet turned on, no beacons
- Six schools in Canada and USA
- Some general QSOs
- Crew very busy!



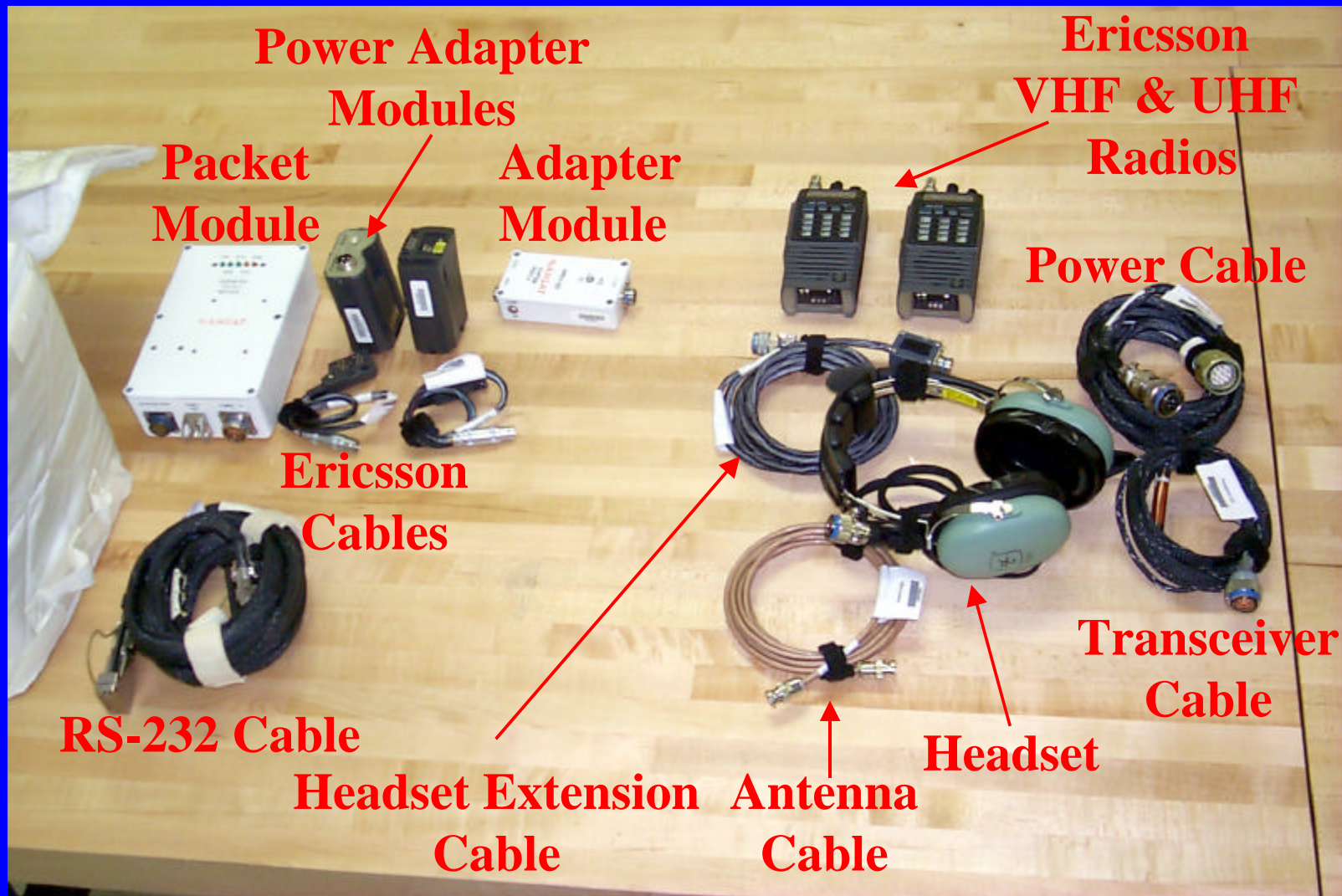
Temporary
ARISS
antenna

SIRIUS ANTENNA LOCATION ON ZARYA

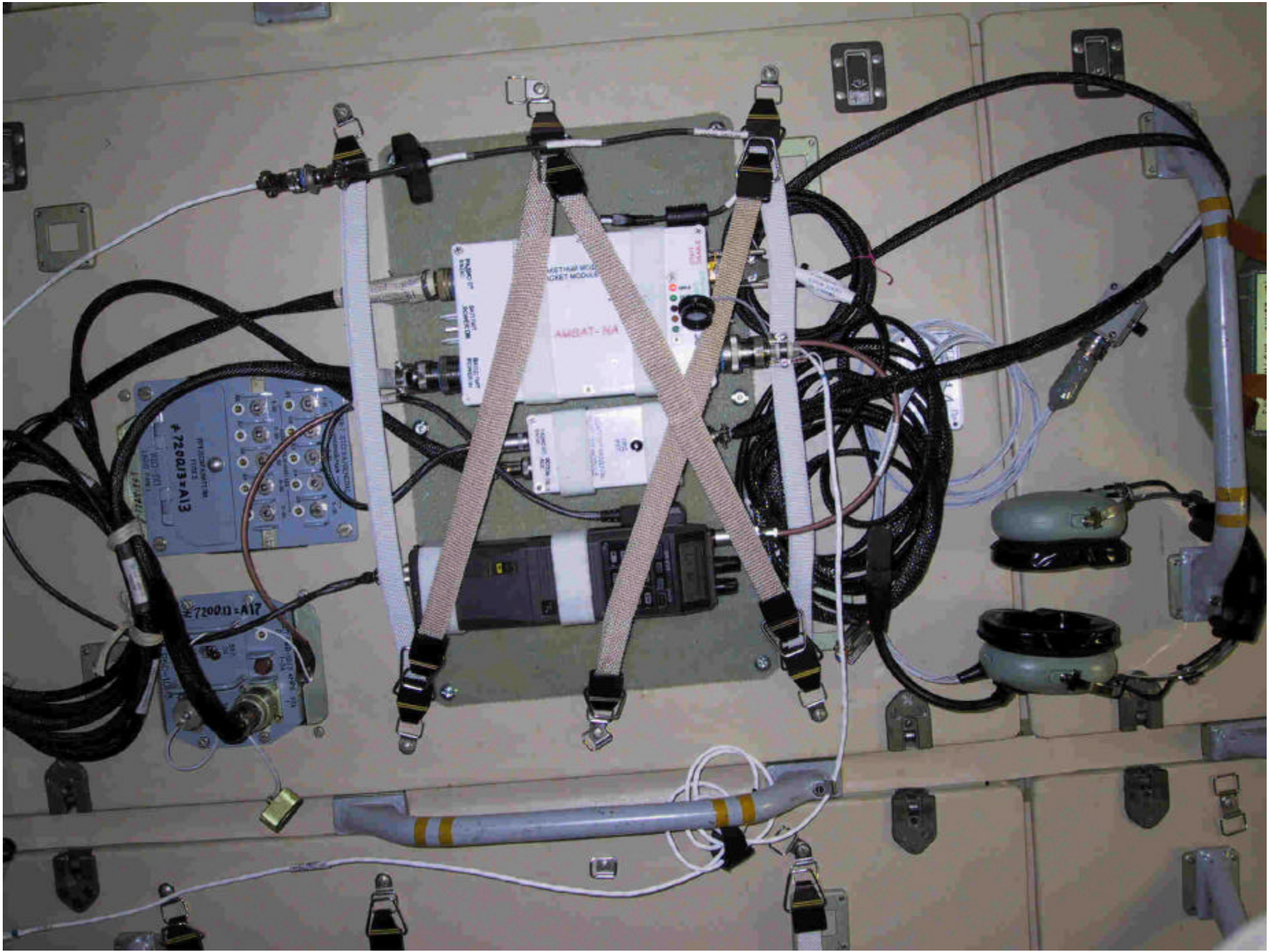




ARISS Provided Hardware to ISS HAM at SPACEHAB for Launch on STS-106 (2A.2b)







U5MIR in the ISS ham shack



Expedition Two: March 2001 to August 2001



- Yuri Usachev, UA9AD
- Jim Voss, no call
- Susan Helms, KC7NHZ

- Numerous general QSOs
- Fourteen school events

- Packet debugging
- Non-North American schools
- Cosmonautics Day (April 12)
- Field Day!



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Tourists in space



- Dennis Tito, KG6FZX, in May 2001
- ARISS telebridge support for family contacts
- At least one general QSO attempt
- Mark Shuttleworth in May, 2002
- <http://www.africaninspace.com>
- School contacts with Mark

Expedition Three: August 2001 to December



- Frank Culbertson, KD5OPQ
- Vladimir Dezhurov
- Mikhail Turin

- Lots of schools
- Little general QSO
- Packet enabled

- 2nd packet module

KD5OPQ in the ISS ham shack



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Expedition 4 – December 2001 to May 2002

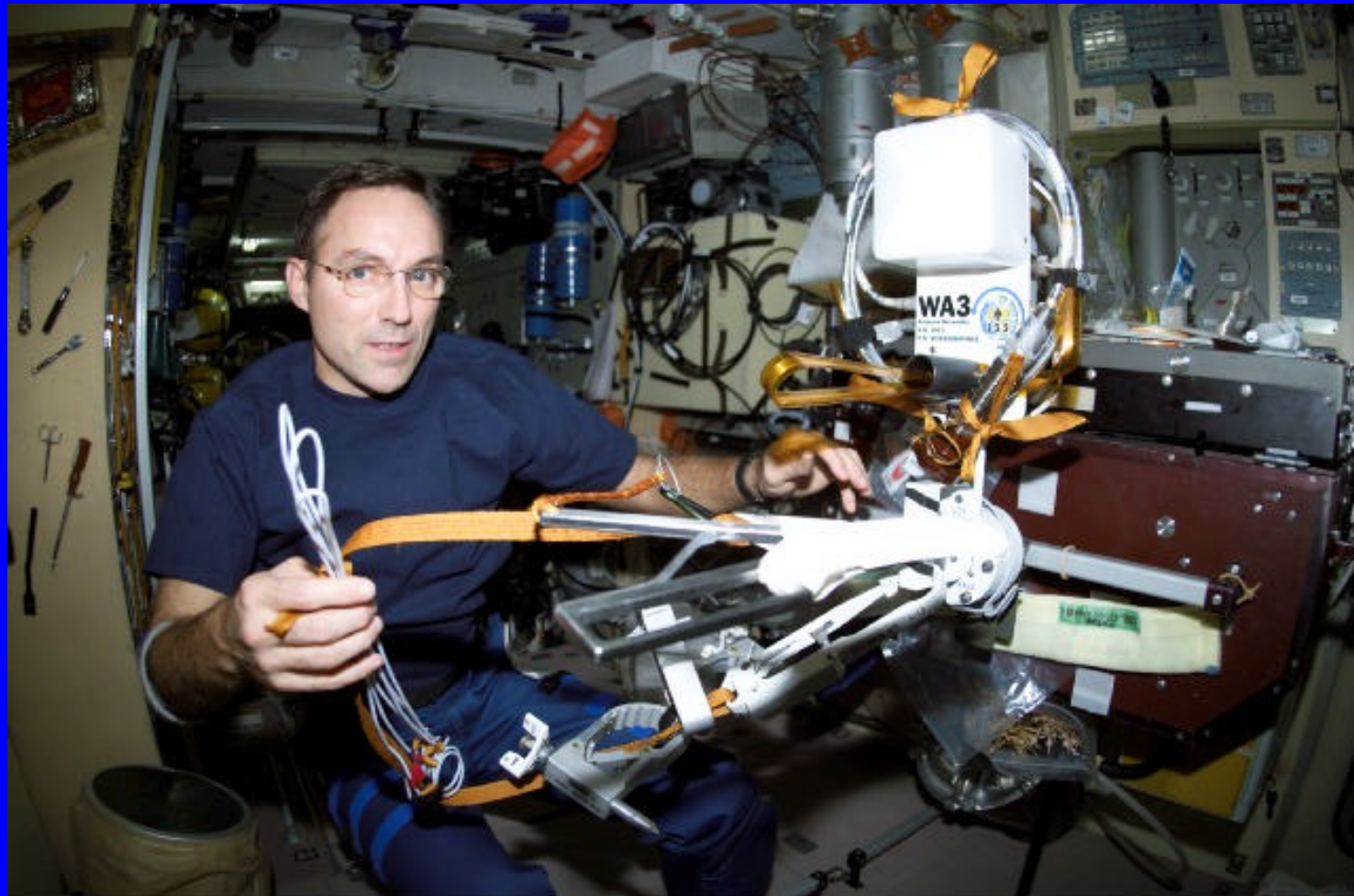


- Onufrienko
- Bursch, KC5PNU
- Walz, KC5TIE

- Few schools
- Little QSO

- New antenna
- Replace packet?

Walz and new antenna

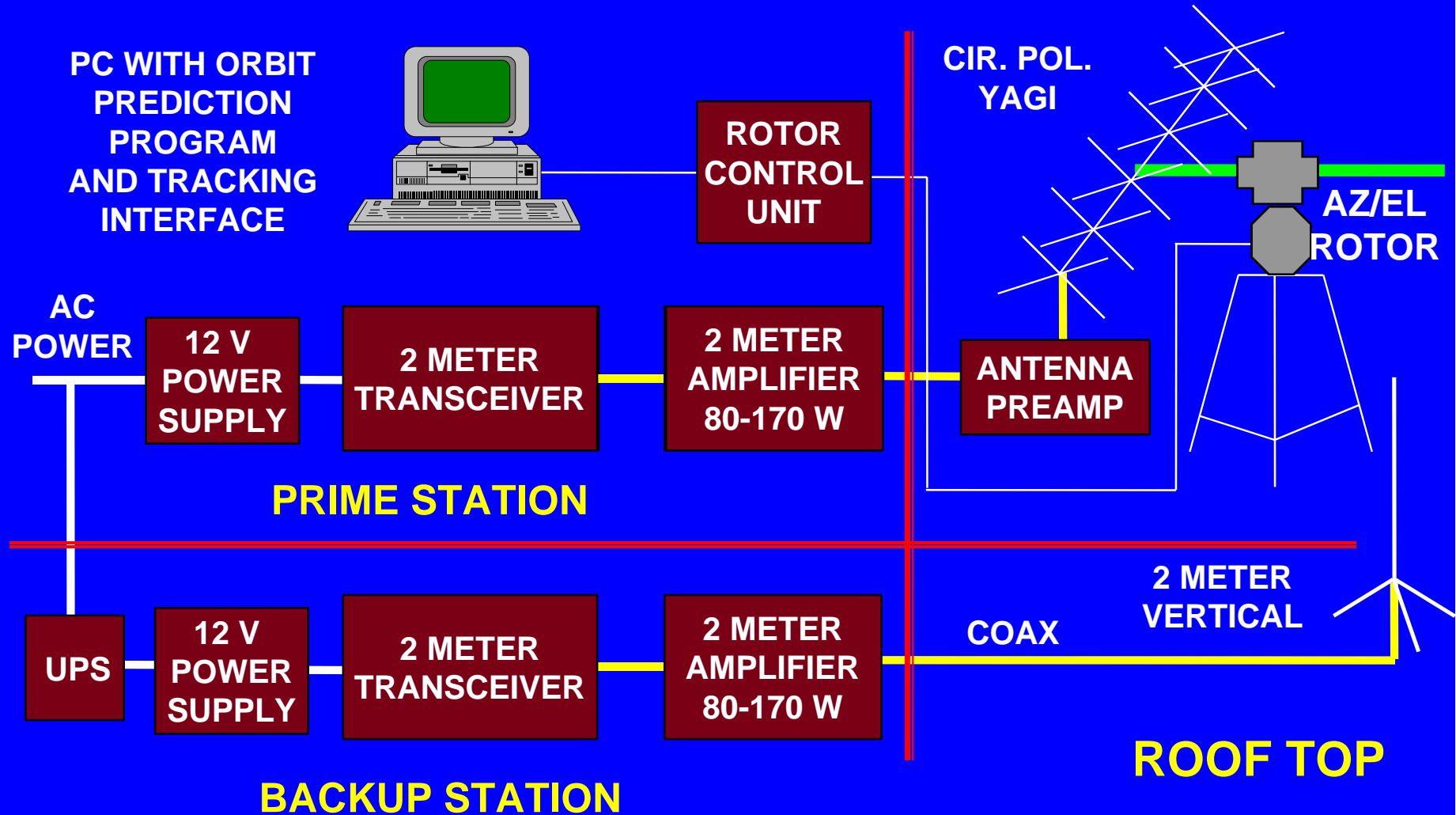


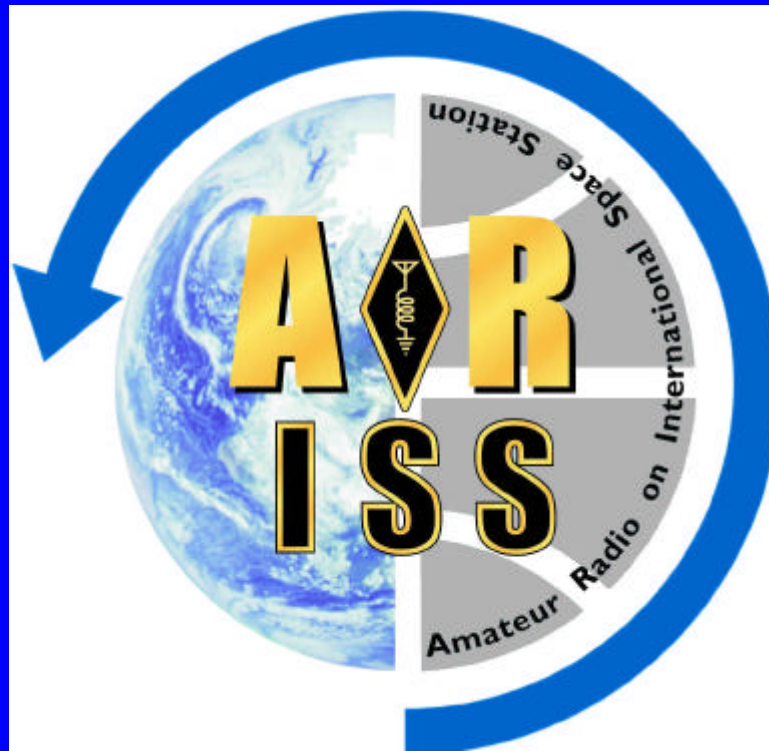
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2m Operations

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

DIRECT CONTACT INSTALLATION





References

- <http://ariss.gsfc.nasa.gov/>
- <http://www.amsat.org/amsat/news/ans.html>
- <http://www.ariss.net/>
- <http://spaceflight.nasa.gov/station/reference/radio>