

Question: What connects Mars Bars, yo-yos and amateur radio?

Answer: The JUNO Mission



First British Astronaut will use GB1MIR

THE SEARCH for the first British astronaut started in June 1989 with a nationwide appeal for volunteers; 13,000 applied! By November, after a seemingly impossible task (involving assessment of medical condition, technical expertise, language and communication skills and crew compatibility), two were selected to commence training near Moscow. This gruelling non-stop 18-month programme has reached its conclusion with both Helen and Tim being declared fit to fly. The final stages have involved working with their respective crews, undergoing simulated space flight practice including docking procedures, high altitude chamber testing for space suit integrity and extensive physical training to achieve peak fitness for the mission.

Before being selected for astronaut training, Helen Sharman (27) was a research technologist at Mars Confectionery (yes, we've heard all the Mars jokes). Before that, she worked at GEC working on the materials used in the manufacture of cathode ray tubes. In addition to a wide range of athletic interests, she plays the saxophone.

The first choice soviet crew comprises Anatoli Artsebarski who was one of the back-up crew for the recent Soviet-Japanese TBS Mission, and Sergei Krikalyov who is the only crew member to have been into space - he flew with Soyuz TM-7 in November 1988.

Final selection of the crew takes place only 24-hours before the flight so each must train assuming he or she will be going.

Juno

FINANCED BY the Moscow Narodny Bank, the JUNO Mission involves some twenty experiments which will occupy the crew for about seven hours each day. The experiments include the production of monocrystals and micro-organisms, and investiga-

tions into human hearing, the growth of plants, and stress reduction in space stations (and that, of course, is one of the uses of the amateur radio).

Rescued by Space School . . .

FOLLOWING A shortage of industrial sponsorship for the UK side of the mission, which almost caused it to be cancelled, the Moscow Narodny Bank in London agreed to underwrite the launch costs. This still left the astronaut with no official experimentation.

JUNO engineering project manager Rodney Buckland at Brunel University had the idea of involving schools to generate experiments which would not require external funding. He approached Richard Horton, G3XWH, who is Head of Physics and Information Technology at Harrogate Ladies' College with a view to linking Mir with some of the schools around the UK.

. . . . and Amateur Radio

HARROGATE LADIES College has a very keen interest in space technology and has been promoting amateur radio for over ten years with 30 girls having received callsigns. The invitation to participate with the JUNO Mission stemmed from the college having appeared on BBC1's award winning *Newsround* programme and on the RSGB's video *Amateur Radio for Beginners*.

Richard Horton contacted the RSGB's Amateur Radio Secretary, David Evans, who requested the Radiocommunications Agency to issue the special callsign GB1MIR to the Astronaut and a series of callsigns with very rare four-letter suffixes to the participating schools. The RA wrote readily agreeing to these rather unusual requests and wishing every success to the mission and all involved in it.

Using the callsign, GB0JUNO,

six licensed YLs at Harrogate will spearhead the link to Mir (callsign GB1MIR) and will pass transmission to the other eight schools involved in the experiment. Communication time will be limited as there are only four periods of just over ten minutes when Mir can 'see' the UK. This will, of course, be turned to advantage as it will teach the prediction of antenna bearings and conciseness in passing information.

It is expected that pupils will be able to ask Helen Sharman questions regarding the experiments she is undertaking. It is possible that a number of overseas schools will also participate. It should also be possible to talk to radio amateur cosmonaut Musa Manarov.

Experiments

A NUMBER OF UK schools and educational groups, including Harrogate Ladies College and Canterbury High School (featured in April 90 RadCom's *Close Encounters with a Moon Man*) have sponsored experiments for Helen to do, under the title Space School

For instance, seeds (from Suttons) will be taken to the space station to orbit the earth for 6 months and will subsequently be grown alongside similar seeds

which have stayed on earth, and any difference noted. Another involves measuring the swelling of small cylinders of a Welsh potato when immersed in various common salt solutions. To provide a teaching resource for British schools, Helen will take photographs of interesting geological and environmental phenomena from space using a 60mm by 60mm Hasselblad camera.

Quite the simplest and most intriguing experiment comes from UK Students for the Exploration and Development of Space, and concerns the analysis of the mechanics of the motion of a yo-yo in the virtual absence of gravity.

Publicity

IN ADDITION to being a very exciting experience for those taking part, and yet another demonstration of amateur radio being involved with science and exploration (with enthusiastic endorsement by the Government), the event should provide the hobby with a great deal of publicity and may encourage more recruits.

The first UK astronaut is likely to attract a great deal of press, radio and TV coverage, including schools programmes.

The Callsigns

GB1MIR	Helen Sharman on the Mir Space Station
GB0JUNO	Harrogate Ladies' College
GB1JUNO	Bigyn Co Primary School, Llaneli
GB2JUNO	Alford Academy, Aberdeenshire
GB3JUNO	Hewett School, Norwich
GB4JUNO	Canterbury High School
GB5JUNO	Belfast Royal Academy
GB6JUNO	Looe School Sunrising, Cornwall
GB7JUNO	The Royal Grammar School, Guildford
GB8JUNO	Orwell Park School, Ipswich



The JUNO Mission crew (l to r): Anatoli Artsebarski, Helen Sharman and Sergei Krialov.

CQ EARTH - How it all started

Abridged by kind permission from an article in *The AMSAT Journal*
by Valery Kondratko, UV3DQE, and Joe Kasser G3ZCZ.

A MANNED SPACE flight that excited amateur radio began routinely on 21 December 1987, when Commander Vladimir Titov and spacecraft engineer Musa Manarov joined the Mir orbiting complex, for a one year tour of duty. For the first two weeks of a flight, the cosmonauts got acclimated to the space station. Stellar observations, photographing of the Earth's surface, medical check-ups and experiments, and maintenance of the spacecraft systems occupied all the crew's attention. After that, things fell into a routine as, unlike in ships at sea, there is no weather in space to cause distractions. This happens to all long duration crews, so they try to find something interesting to counteract the monotony and boredom, and avoid negative psychological effects.

Initial Steps in Ham Radio

IN A CONVERSATION with ground control in March 1988, Musa Manarov asked for copies

of *Radio* magazine to be sent up. The Psychological Support Group asked the editorial offices of *Radio* to provide several issues. They were delighted by his interest and enclosed a letter with the magazines asking whether he would like to operate on the amateur bands himself. Musa replied that there was no amateur equipment on board, that he didn't have an amateur license, and that in general no one among the crew members had operated on the air, but that, if mission control would help resolve these matters, he'd be happy to get on the air during his free time.

From that moment, the Flight Control Centre and the *Radio* editorial offices began to make things happen. As word spread that a transceiver was being sought, Valery Agabekov, UA6HZ, offered his YAESU FT-290 which was delivered to Mir by the regularly-scheduled freight vehicle "Progress-37".

Homebrew in Orbit

DELIVERY OF the transceiver didn't mean that operation could

begin; Musa still needed an antenna. For the sake of maintaining dependable official communications, they decided not to connect the FT-290 to the existing antennas. After considering the alternatives, Musa concluded that it was necessary to put a separate antenna on the outer surface of the station's fuselage and to connect it to the existing hermetically sealed connector during an extra vehicular activity (EVA).

Installing the Antenna

AN EVA TO SERVICE the X-Ray telescope took place in June, 1988. Musa planned to use the occasion to install his homebrew antenna. However, the work outside the station lasted over 5 hours which used up almost all of the resources of the cosmonauts' spacesuits. There was no question of installing the antenna during that EVA, and it was postponed until the next one. Making use of the forced postponement, Musa asked mission control to send up a commercially-built unit so that they would have a spare on board.

On 30 August, 1988, the regularly-scheduled 'Soyuz TM-6' transport docked with the station, carrying an international Soviet-Afghan team including Valery Polyakov who subsequently joined the permanent crew to carry out advanced medical research.

Soon afterwards, in September 1988, a freight vessel delivered the antenna. By then, licenses had been issued to the cosmonauts; Vladimir Titov became U1MIR, Musa Manarov U2MIR, and Valery Polyakov U3MIR.

While preparing for a regularly-scheduled EVA, U2MIR prepared the antenna. He attached a handle made up of insulating tape to its base so that it would be easy to hold in his spacesuit glove and, as a final touch, he snipped a little red flag from his suit and stuck it on the end of the antenna.

A month later, work went very well during a regularly-scheduled EVA so the crew had time to install the amateur radio antenna. From the transfer compartment, U1MIR passed the antenna to U2MIR, who worked his way along the outer fuselage of the

station to the conical part of the working compartment. He then disconnected the hermetic convertor from the screen-vacuum isolation, and affixed the antenna to it. They were now ready to go on the air.

For some time after they first turned the set on, the trio just listened. At first, all they heard was noise. The first distinct speech came through when they were flying over the USA. Since none of the crew had previously operated on the air, difficulties arose. The first problem was language. The crew members could read and write English, but none of them could speak it fluently. They also had problems understanding the pronunciation of callsigns.

Recognizing these difficulties, mission control invited some radio amateurs to the ground control centre to help the crew. Teaching sessions were set up, to which radio amateurs came for consultations.

The first QSO

THE FIRST QSO, which took place on 8 November 1988, was with Leo Labutin, UA3CR, operating from UK3KP, the amateur radio station at the newspaper *Komsomol'skaya Pravda*. They made another QSO with UA3CR a few days later on 12 November, but this time Leo was sitting in a car in Atlanta, Georgia, with Byron Lindsey, W4BIW, and operating as W4BIW/M (being helped/watched by a host of others) at the AMSAT 1988 Space Symposium in Atlanta.

Who blew it?

SOME TIME later while flying over the United States, U2MIR heard a conversation between two high-quality stations. Wanting to join the conversation, he broke in and gave his callsign as U2MIR. They came back and asked him who he was. He repeated the callsign. "It's probably someone messing around" said one to the other,

and they continued their conversation, ignoring U2MIR's attempts to contact them!

On the Air

MUSA INSTALLED the transceiver in his cabin. Now he went on the air whenever he had free time. He gradually acquired confidence, understood callsigns more easily, and became more proficient in spoken English. The others also tried their luck, but couldn't completely overcome their fear of the microphone. U3MIR translated for Musa what others were saying, but refrained from speaking into the microphone himself.

It didn't take long for the amateur radio world to know that a ham radio station was operating in orbit. Now others were calling Musa. While flying over Argentina, he contacted Carmen, LU1UK. When she understood whom she was talking with, she exclaimed "Wait!" - as though the space station could slow its orbit - and disappeared for a minute. A few minutes later Simon, LU6YH, called U2MIR. Carmen had telephoned him and told him to get on the air. LU6YH became a regular correspondent and one day U2MIR heard words in Russian from LU6YH during a QSO. It turned out that Simon had invited the Deputy Minister of the Forestry Industry of the RSFSR, who was in Argentina on official business, to be present for that contact.

The large number of stations in the US and Europe made contacts difficult, since signals came through as solid QRM. Beyond the Urals silence set in; in this area there are practically no radio stations. It was very pleasant to work stations from the Republic of South Africa and Australia; they operated in a very disciplined fashion. ZS2ELL couldn't manage to get through and started to call, inserting the Russian words *na zdorov'ya* (to your health) and *perestroyka*. Musa, of course, was impressed by the attempt and a contact took place.

Radio Amateur Becomes Telecomms Minister

Mr Katsutsugu Sekiya, JA5FHB, has become Japan's Minister of Posts and Telecommunications. Mr Sekiya has been licensed since 1970 and is one of the founding members of the Diet Ham Club (that's Diet as in national assembly, not as in food), comprising twenty-one members of the House of Representatives, one member of the House of Councillors and 59 of the Diet staff.

At a reception held by the Japanese Amateur Radio League, Minister Sekiya said that without the support of JARL members he could not have been appointed to the post. Prospective UK Cabinet Ministers please note!



Return to Earth

THE CREW WAS able to make over a thousand contacts with radio amateurs until 21 December when, after an unprecedented year-long flight, the cosmonauts returned to Earth. Much more time will be needed to assess the meaning of the results of over a year of scientific research. But already the crew's contribution in setting up the 'Space - Earth' amateur radio bridge can be assessed.

A lengthy stay in a limited space has a negative psychological effect on human beings; boredom sets in. Although an orderly schedule of work and rest time contributes to morale, it helps to find something to be really interested in. All crews adopt important milestones and points of reference for counting off the duration of the flight. These consist of: the launch, docking with freight vehicles, meetings with visiting expeditions, EVAs, and from now on ham radio.

With the addition of the amateur radio station aboard the spacecraft, the communications horizons of the cosmonauts has widened. Until then, their external communications had been restricted to the Flight Control Centre, even though specialists, relatives, etc had come to the Flight Control Centre to communicate with them. Amateur radio made possible random meetings and new acquaintances, an extremely important factor in the psychological health of the crew. Now, while over-flying any continent, providing they have the time, they can find someone to talk with.

The radio station remained on the spacecraft, and since that precedent setting flight, U4MIR and U5MIR operated briefly. On

March 9, 1990 Anatoly Soloviev, U6MIR, and Alexander Balandin, U7MIR, started operating. The US STS-35 Space Shuttle flight carrying SAREX and Ron Parise, WA4SIR, (which finally took place last December) provided the opportunity for the first-ever Shuttle to Mir linkup.

The future

WHETHER THE Mir ham radio bridge experiment will be continued indefinitely will depend on the wishes of future Cosmonauts. Ham radio is being tested aboard Mir as an important activity for contributing to the success of long duration spaceflight. Remember that in general, just like the American astronauts, most cosmonauts are not radio amateurs. Consequently, most of the hams on Mir are new to amateur radio, and their reaction to being the target of a pile up may be to go QRT. If you hear Mir calling from space, remember who you are speaking to; your behaviour may influence the future of manned amateur radio in space.

Mir Spacecraft Technical Manual

Published by AMSAT-UK

£4.95

from

AMSAT-UK,

94 Herongate Rd,
Wanstead Park, London, E12 5EQ.