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BAN NUCLEAR REACTORS IN ORBIT

Volume 41, No. 9 November 1988

AVOIDING CHERNOBYLS IN SPACE: BAN REACTORS IN ORBIT

Nuclear power sources in Earth orbit have significant environmental problems. As the information in this edition of the newsletter indicates, there is approximately a 15% failure rate for past space nuclear power missions both US and Soviet. Arguably, the worst accident to date was the 1964 reentry and burnup of the US SNAP9A, which tripled the world's environmental burden of plutonium-238. However, these environmental contamination incidents pale in comparison to what can occur if such an incident were to occur with a reactor designed to be used for a Star Wars defense, which would contain hundreds to thousands of times the long-lived radioactive inventory of past and current systems.

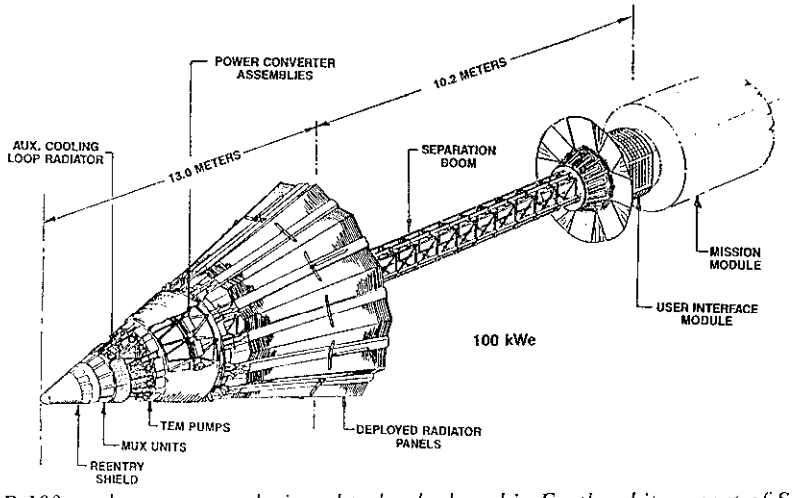
The Soviets currently use reactors to power their RORSATs, satellites which target US naval movements. In addition to the unacceptable history of accidents with nuclear powered RORSATs (e.g., the Canadian crash of Cosmos 954 in 1978 and the reentry and burnup of Cosmos 1402 in 1983), RORSATs are viewed by the US as militarily provocative and provide a principle justification for the US ASAT program. Similarly, the primary motivation for the current US program to develop very much larger space nuclear sources is SDI, viewed as very destabilizing by the Soviets.

The Joint proposal by FAS and the Committee of Soviet Scientists(CSS), issued at a press conference with Academician Sagdeev in May at the National Press Club, calling for a ban on nuclear power in Earth orbit, is "spherically sensible." No matter from which direction you look at it, it has much going for it. As an arms control measure, it can help restrain pressures for ASATs; it can help eliminate a military threat to the US (RORSATs) and one of concern to the Soviets, the prospect of weapons in space. A reactor ban could be verified because of the strong gamma and infrared signals given off by the reactor. Whereas verifying a ban on specific SDI systems might be difficult, verifying a ban on their nuclear power sources is relatively simple.

As an environmental measure, such a ban can protect the Earth environment from the consequence of accidents involving nuclear power sources that fail to remain in orbit. It would not interfere with legitimate deep space scientific missions, which might require nuclear power. And it would help bring home the public debate about SDI—that it is not a crayon-colored rainbow far off in space, but it is proposed to be perhaps a hundred small Chernobyls floating overhead. Space is, after all, only a hundred miles away. And the history of space nuclear power is that some unacceptably large fraction of what goes up also comes back down to Earth.

Star Wars is not non-nuclear, not far away; it is nuclear, and close to home. The Soviets and the Americans should agree to ban the use, by either of them, of nuclear power in Earth orbit. ■

DEPLOYED CONFIGURATION



The SP-100 nuclear reactor, designed to be deployed in Earth orbit as part of SDI.

KGB, Meet CIA—page 8

A JOINT PROPOSAL TO BAN NUCLEAR POWER IN EARTH ORBIT

Text of the Joint Statement released by FAS and CSS on May 13, 1988.

The proposal which we put forward on behalf of our two organizations (after two joint workshops) to ban nuclear power in Earth orbit grows out of our efforts to prevent both the radioactive contamination of the Earth's surface and the extension of the arms race into space. In particular, this agreement would prevent the use of reactors in Earth orbit by either side for any purpose—whether offensive or defensive, including the use of reactors to power surveillance satellites.

The use of nuclear power in space is still at an early stage but already there have been accidents which have caused worldwide concern.

An agreement to ban nuclear reactors from orbit would be a major barrier to any future arms race in space since nuclear reactors are compact sources of large quantities of power necessary for many military purposes. Meanwhile, as far as civilian activities are concerned, solar energy collectors and fuel cells will be a more convenient and safer source of energy in Earth orbit for the foreseeable future. Energy sources powered by quantities of radioisotopes below an agreed safe threshold could also be permitted for these purposes.

Deep Space Missions Permitted

The ban on reactors in orbit would not prevent the use of nuclear power for deep space scientific or exploratory missions with associated very limited tests under agreed safeguards of such deep-space reactors in Earth orbit.

Verification of a ban nuclear power in orbit would be relatively straightforward because an operating (or even recently operating) nuclear power source would emit large amounts of detectable infrared, gamma and neutron radiation.

We therefore call for an international agreement to ban nuclear power in orbit and our two organizations plan to continue to work on the technical aspects of this ban in the context of our five-year Joint Verification Project.

Roald Sagdeev
Chairman
Committee of Soviet Scientists Against the Nuclear Threat

Frank von Hippel
Chairman
Federation of American Scientists Fund

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NUCLEAR POWERED SATELLITES SHOULD BE BANNED

The six month fall of the nuclear powered Soviet satellite Cosmos 1900, despite its happy ending, is simply the latest episode in a series of recurring mishaps involving space nuclear power. Accidents and failures have been prominent features of both the American and the Soviet space nuclear programs. And while the Soviet Union has routinely launched a couple of reactor-powered military satellites per year, the United States has been vigorously pursuing the development of much larger space nuclear power supplies. These US programs are motivated largely by the Strategic Defense Initiative and the prospect of deploying nuclear powered SDI weapons platforms in orbit.

Nuclear Power in Space Takes Two Forms

Two basic types of nuclear power supply have been launched into space, nuclear reactors and "radioisotope thermoelectric generators," or RTGs. Both of these systems produce heat which is then converted into electricity. In the case of ~~reactors~~ RTGs, the source of heat is the natural decay of a highly radioactive substance (plutonium-238 in all US-launched systems).

Some fraction of this heat is converted into electricity by means of thermoelectric cells, thermionic elements, or more efficient dynamic converters. The remainder of the heat must be radiated away into the vacuum of space. This, incidentally, helps make an operating reactor a highly detectable object.

The Soviet Union and the United States have launched dozens of nuclear powered satellites. The Soviet Union has relied primarily on nuclear reactors, while the US has mainly used RTGs.

Between 1961 and 1977, the US launched a total of 23 spacecraft powered by more than three dozen RTGs and one nuclear reactor, in support of both military and civilian missions. All of these systems were generally quite small. The largest, the SNAP 10A reactor, generated only 500 watts of electricity. Nine nuclear powered spacecraft launched by the US remain in long-lived Earth orbits. The last RTG-powered spacecraft was launched in 1977. NASA's Galileo mission to Jupiter is the next RTG-powered mission and is scheduled for launch in October 1989. The US space nuclear reactor program was terminated in 1973, due to the lack of missions requiring a space reactor. It was not revived until the start of the SP-100 Program, described below.

The Soviet Union has launched about 33 nuclear reactor-powered satellites and several RTG-powered satellites and lunar modules, and is currently the only nation to use nuclear reactor-powered satellites in orbit.

A remarkably large fraction—about 15%—of all nuclear powered spacecraft in both the US and Soviet space programs have suffered accidents, launch aborts, or other failures (see box on page 4).

Even those satellites that were deployed in (or boosted into) a stable orbit present certain hazards. In their book *Artificial Space Debris*, Nicholas L. Johnson and Darren S. McKnight note that all but a few of these satellites reside in those parts of near Earth space most densely populated with space debris. A space reactor colliding with such debris "may produce as many as 1,000,000 particles with a diameter of 1 millimeter or more. Some of these particles will be injected into . . . regions populated by large, manned spacecraft. Even if these particles do not strike other spacecraft, they will begin to decay at an accelerated rate and reenter the Earth's atmosphere much quicker than previously calculated." Johnson and Mcknight conclude that "current storage orbit practices . . . are insufficient to ensure the protection of continued space activities and of the Earth's biosphere in both the near and the far term."

Steven Aftergood (for The Committee to Bridge the Gap) and Daniel Hirsch (for FAS) testify before the Senate Energy Committee. Both were instrumental in developing this proposal, some years ago, with the LA-based Committee to Bridge the Gap.

Hazards Become Severe

The future hazards of space nuclear power could become all the more severe considering the increased power level and operational life of the power supplies now under development. According to a confidential 1979 Department of Energy contractor study, the reentry and disintegration of a 1 megawatt-thermal reactor immediately following ten years of operation could result in as many as 30,000 to 50,000 fatal cancers.

(Evidently, as a matter of policy, official consequence estimates for space nuclear power accidents are withheld from the public unless and until Congressional pressure forces their release. A Freedom of Information Act request for a document providing risk calculations for a range of generic space nuclear power missions was recently denied on the grounds that release of this information "could reasonably be expected to cause damage to the national security."

The consequence of a reactor reentry scenario can be reduced by delaying reentry following shutdown, which allows time for decay of some of the radioactive fission products. In this connection, it is disturbing to note that the Department of Energy has abandoned an earlier commitment to deploy space reactors only in a so-called "nuclear

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ACCIDENTS AND MISHAPS INVOLVING SPACE NUCLEAR POWER

• 1964: When the US Transit-5BN-3 navigational satellite failed to achieve orbit on April 21, its SNAP-9A radioisotope power source disintegrated in the atmosphere at an altitude of about 50 kilometers. Release of its 17,000 Curies of plutonium-238 tripled the worldwide inventory of Pu-238, increasing the total plutonium inventory from weapons testing by about 4%.

• 1965: On April 3, the US Snapshot experimental satellite, bearing the only space reactor launched by the US, a 500 Watt SNAP-10A, was launched. The reactor functioned for 43 days before being permanently shut down by a voltage regulator malfunction. While it remains in a long-lived orbit, portions of the satellite have begun to break up.

• 1968: On May 8, the US Nimbus-B-1 meteorological satellite was aborted following a launch failure, and fell into the Pacific Ocean just off the California coast. Its two SNAP-19A RTGs could not be located for five months but were finally retrieved intact.

• 1969: A Soviet launch failure occurred on January 25 that may have involved a nuclear powered RORSAT ocean surveillance satellite.

• 1969: On September 23 and October 22 the USSR launched unmanned probes to the Moon. Both achieved Earth orbit, but reentered the atmosphere a few days later. According to various sources, one or both of them carried a polonium-210 heat source, and measurable amounts of radioactivity were detected in the atmosphere following reentry.

• 1970: A US Moon mission, Apollo 13, was aborted in April. Its jettisoned lunar lander fell into the Pacific Ocean. The SNAP-27 plutonium power supply has never been recovered but is assumed to have remained intact. Atmospheric sampling detected no release of radioactivity.

• 1973: On April 23, another Soviet nuclear-powered RORSAT fell into the Pacific Ocean north of Japan after a launch failure.

• 1978: The Soviet Cosmos 954 reentered the atmosphere on January 24, spreading thousands of pieces of radioactive debris over more than 100,000 square kilometers of northwest Canada. A few fragments were sufficiently radioactive (gamma radiation as high as 500 roentgen per hour near contact) to provide lethal doses.

• 1983: The jettisoned reactor core from the Cosmos 1402 reentered the atmosphere on February 7, where it disintegrated and was dispersed.

• 1988: Radio contact with Cosmos 1900 was lost in April of 1988. The satellite's orbit decayed steadily for nearly six months before backup systems were finally activated and the on-board reactor was boosted to a higher orbit, just days before it had been expected to enter the atmosphere. ■

(Continued from page 3)

safe orbit," that is, an orbit sufficiently high and long-lived to allow radioactive decay of a large fraction of the radioactivity in the reactor core before the satellite reenters the Earth's atmosphere.

US Developing Several Programs

The US has several space nuclear power development programs underway. The SP-100 reactor, designed to provide 100 kilowatts of electricity (2.5 megawatts-thermal) continuously for seven years, is the cornerstone of the current effort. After a ten year hiatus, it is the first US space reactor program to be initiated. As such, it is viewed as a "test case" for the near-term technical feasibility and political acceptability of advanced space nuclear power systems.

The SP—100 is a fast spectrum reactor, fueled with about 190 kilograms of fully enriched uranium nitride fuel, and cooled by liquid lithium metal. While the reactor core is physically rather small (less than a cubic meter), the radiator panels have a total area of about 100 square meters. The payload must be separated from the reactor by an extension boom to reduce the intense radiation dose received from the operating reactor (see diagram on pg. 1).

The Multimegawatt Program, another US space reactor effort, is researching much more powerful reactors, capable of generating tens to hundreds of megawatts.

A third US nuclear program is working on the Dynamic Isotope Power Systems (DIPS), a radioisotope heat source coupled to a dynamic energy conversion system to produce 1 to 10 kilowatts of electricity.

In addition, there are two lesser-known nuclear programs with possible space applications called Centaurus and FALCON (Fission Activated Laser Concepts). Both of these programs are seeking to develop laser weapons driven, or "pumped," directly by the energy of fission fragments produced in a nuclear reactor.

The new generation of nuclear power supplies represents a very large increase in power level and operating lifetime—and, to that extent, in associated risk—over past and current systems.

Thus, for example, at the end of its seven year operating lifetime, the SP-100 will contain several hundred times more long-lived radioactivity than the Soviet Cosmos 1900. While a hypothetical worst case accident involving a reactor such as Cosmos 1900 could conceivably produce hundreds of fatal cancers, there would be sufficient radioactivity in an SP-100 to cause tens of thousands of fatal cancers, using the assumptions of the DOE contractor study mentioned above.

One single DIPS radioisotope system at a power level of 6 kilowatts will contain over 50 times as much plutonium-238 (about 53 kilograms) than did the SNAP 9A power supply that disintegrated in 1964. Put another way, one DIPS unit will contain two and a half times more plutonium (measured in Curies) than all of the plutonium fallout (of all isotopes) from all atmospheric weapons tests.

Of course, the risks of nuclear powered space missions

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TESTIMONY OF ACADEMICIAN ROALD SAGDEEV SUBMITTED TO THE US SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES HEARING ON COSMOS 1900 AND THE FUTURE OF SPACE NUCLEAR POWER SEPTEMBER 13, 1988

The following was excerpted from Sagdeev's statement which was submitted in writing

In May of this year two organizations, the Federation of American Scientists (FAS) and the Committee of Soviet Scientists for Peace and Against the Nuclear Threat (CSS), made a joint proposal to ban nuclear power in Earth orbit. The development of technical possibilities for human civilization increases enormously the risk for humankind. Two disasters—Chernobyl and Challenger—forced us to reexamine the use of nuclear power in space.

At present, this direction of scientific and technical activity is at an early stage of development. Up until now, both Soviet and American space programs involved only launches with comparatively moderate amounts of dangerous radioactive materials. This makes it even more important to look realistically at the experience we are having now with radioactive contamination of the environment when accidents take place. The long-term consequences under worst case conditions of an accident involving the large space nuclear reactors contemplated for the future can be comparable to the long-term consequences of Chernobyl. The same can be said of the long-term consequences of accidents involving the isotope power sources containing considerable amounts of Plutonium-238 (for example, the Dynamic Isotope Power System, where the amount of Plutonium would be tens of kilograms).

Nuclear Safe Orbit Concept "Dubious"

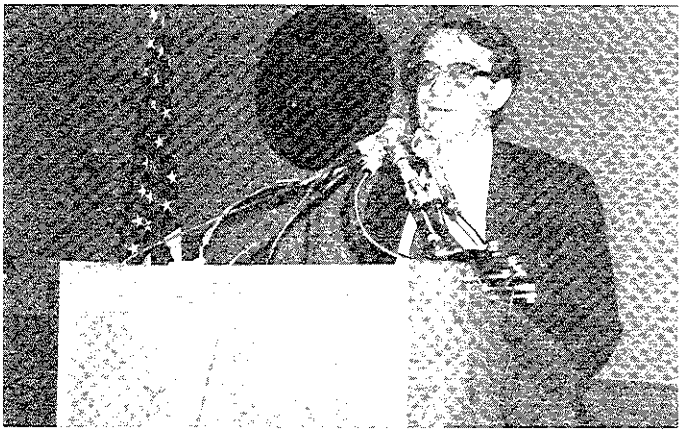
The concept of a "nuclear safe orbit" where the reactors can exist without the danger of falling down practically forever is still dubious. Nobody can exclude the possibility of technical error, criticality accident, or collision with meteors, which can lead to reactor exploding or disintegrating and then some part of it falling to Earth. A collision with space debris, the amount of which is growing rapidly, could also result in such an accident.

In the Space Research Institute of the USSR Academy of Sciences we performed a detailed analysis of possible future scientific missions in near and deep space for the foreseeable future. We were unable to find projects at least for the next 15 years which could not be carried out without the use of nuclear power. Although further study is needed, it now appears that even the manned mission to Mars can technically be realized effectively using the non-nuclear sources of energy.

As I stated at the press conference on May 13 of this year at the National Press Club in Washington, the New Thinking (Perestroika) means getting rid of old garbage. I would include in that category current and planned uses of space-based nuclear power for military purposes. Furthermore, I am quite sure that the existence in space of a considerable number, even of civilian nuclear sources, will always produce a temptation for some people to revive ideas of space militarization, contributing a destabilizing factor to the relations between our two countries.

Taking these factors into account, we propose a ban on nuclear power of any sort in Earth orbit and a fifteen year moratorium on reactors for other space uses. This would not preclude the use of small isotope sources for deep space missions. I have had the opportunity to explain the position of CSS on the issue of the future of nuclear power in space to high officials of the Ministry of Foreign Affairs of the USSR. Please permit me now to appeal as well to members of the United States Senate Committee on Energy and Natural Resources.

Thank you for this rare opportunity. □



Academician Roald Z. Sagdeev, Chairman of the Committee of Soviet Scientists for Peace and Against the Nuclear Threat, at the National Press Club.

REPRESENTATIVE GEORGE BROWN ACTS TO BAN NUCLEAR POWER IN ORBIT

On September 13, Rep. George Brown, Jr. (D-Calif.) introduced a bill in the House of Representatives "to promote a United States-Soviet Union ban on the use of nuclear power sources in the orbit around the Earth."

The bill urges the President to "call on the Soviet Union to abandon the use of nuclear power sources in Earth orbit and to join the United States in negotiations to establish a mutually verifiable and permanent ban on nuclear power sources in Earth orbit."

If the Soviet Union does officially abandon the use of nuclear power in orbit, and the President so certifies, the bill would require the United States to do the same.

The bill would further require the phase-out of plutonium-fueled radioisotopic power sources, in favor of uranium-fueled reactors, by 1998, since uranium-fueled systems are safer to launch. ■

(Continued from page 4)
can be partially reduced by proper design and judicious deployment. To their credit, the current US space nuclear power programs have included a number of useful safety features in US designs. But the growth of the new space nuclear power systems will raise the stakes, along with the consequences of continued failures, enormously.

Beyond the environmental risks of space nuclear power, this technology also presents dangers because of its expanding role in provocative military space systems.

This danger is already evident in the current use of nuclear reactors to power Soviet Radar Ocean Reconnaissance Satellites (RORSATs), such as Cosmos 1900, that track and target US naval vessels. These satellites are deemed sufficiently threatening to US national security that they have been cited by the Pentagon as a principle justification for a US anti-satellite weapon program.

It should be noted that this threat is entirely independent of the environmental hazards. Even if space nuclear power could be made risk-free and accident-proof, an environmentally safe RORSAT would still be a provocation.

A parallel situation exists with regard to space nuclear power programs in the US, which are motivated primarily by the Strategic Defense Initiative and are viewed by the Soviets as a strategic threat.

SDI Only US Client for Nuclear Power in Orbit

Without SDI, in fact, there seems to be little use for orbiting nuclear power supplies in the near term. According to James W. Vaughan, Jr., former DOE Acting Assistant Secretary for Nuclear Energy, " . . . frankly speaking, the major rebirth and driving factor [for the space reactor program] is the President's Strategic Defense Initiative. I think if it were not for that, we would be hard pressed to have a sufficient number of defined missions to sustain it at the levels we're talking about today." Outside of SDI, there is simply no significant demand or near-term need for nuclear power in orbit.

There is, however, a broad consensus that nuclear power would be required for many types of Star Wars weapons. Thus, the American Physical Society Group on Directed Energy Weapons indicated that "perhaps a hundred or more" orbiting reactors might be needed in a fully deployed space-based weapons system. A similar conclusion was reached by the Office of Technology Assessment. And Lt. General James Abrahamson has stated that space reactors will be an essential component of the second phase of SDI, i.e., the stage involving directed energy weapons.

In sharp contrast to the prominence of space nuclear power in controversial military space projects such as the RORSAT program and SDI, it has few near-term applications for more benign, peaceful endeavors such as, for example, commercial space activities. According to one consultant to the commercial space industry, "Very few people want to mess with it," due to concerns about accident liability and launch expense.

It must be acknowledged that there has been an important civilian aspect to space nuclear power. The Pioneer and Voyager planetary missions, for example, have made a valuable contribution to space science and represent a constructive element of US space policy that ought to be encouraged.

But it is noteworthy that these and the majority of the civilian applications of space nuclear power contemplated for the next century are for missions beyond geosynchronous orbit.

This distinction between orbital and deep-space applications is implicit in the recent proposal by the Federation of American Scientists and the Committee of Soviet Scientist Against the Nuclear Threat and is reflected as well in recent legislation introduced by Rep. George Brown (see pg. 5). These initiatives offer a middle path that would eliminate the more threatening current and proposed applications of nuclear power in orbit, while preserving the option of nuclear power for deep space scientific and exploratory missions.

Ban on Nuclear Power in Orbit Verifiable

A ban on nuclear power in orbit should in principle be easy to verify, according to studies performed by the Federation of American Scientists and Committee of Soviet Scientists' Joint Verification Project, since space nuclear power supplies have a variety of identifying characteristics. First and foremost, they must radiate their waste heat into space, producing a distinct infrared signal. In addition, an operating reactor produces a considerable amount of gamma and neutron radiation. There are often also various telltale physical features, such as large radiator panels, a separation boom, etc.

To the extent that new types of space weapons would require the use of nuclear power supplies (as indicated by the American Physical Society, the Office of Technology Assessment, and various DOE and SDIO officials), the proposed ban would make the ABM treaty more readily verifiable. This is because it is likely to be easier to detect a prohibited space reactor than to identify the nature and function of an orbiting weapons platform or ABM sensor powered by the reactor. And even though some types of space weapons may not require nuclear power, it seems that most would.

It should also be observed that there is a basic ethical question associated with the use of space nuclear power.

Rep. George Brown (D-Calif.) offered House bill to ban nuclear power in orbit.

This question arises because a nation that decides to deploy nuclear power sources in space is not the only one that is potentially placed at risk by that decision. Thus, for example, Canada was the unwilling recipient of falling debris from the Soviet Cosmos 954 reactor. A nation may arguably have a right to generate a hazard to itself, but it certainly has no right to impose such a hazard on the rest of the world's population, who have no say in the matter; and it has no right to despoil the world environment. A ban on nuclear powered satellites is an appropriate response to this problem.

It is important to recognize that the status quo of one space nuclear mishap every few years is about to change. If orbital applications of space nuclear power are not restricted, the number of nuclear powered military satellites deployed could increase sharply, along with the power level of the nuclear power supplies, and the magnitude of the resulting accidents.

By eliminating the power supply essential to an assortment of provocative military space systems of the present and the future, a ban on nuclear power in orbit would create a technological constraint on the militarization of space and eliminate a significant environmental hazard. □

—Steven Aftergood

FAS RELEASES INFORMATION ON COSMOS 1900

The US government was conspicuously silent during most of the Cosmos 1900 episode. As a result, it was largely left up to FAS to provide detailed information on the status of the satellite and its possibilities for boost to higher orbit or separation and reentry into the atmosphere.

Daniel Hirsch, Chair of the FAS Working Group on Space Nuclear Power, and Joel Primack of UC Santa Cruz spent a week in Moscow conferring with Soviet scientists and interviewing Soviet officials just prior to the Senate hearing. Hirsch provided these remarks to the Senate Committee on Energy and Natural Resources on September 13 on Cosmos 1900—which has since then self-destructed safely. [Ed. Note: At the last minute before reentering orbit, it ran out of fuel, lost attitude contol, and, accodingly, its fail-safe mechanisms fired the reactor into a higher orbit.]

"Because the Soviets lost radio communications with Cosmos 1900, there was no way to give the command to boost to a higher orbit. Furthermore, the backup system to automatically boost to a higher orbit failed to operate [until September 30] because they were designed to be triggered by one of three potential failures in the satellite, none of which,'unfortunately,' had occurred. The problem was thus, FAS was told by the Soviets, that the reactor and satellite were working 'too well.'

The three failures that could trigger automatic boost to a higher orbit are:

(1) Destabilization of the satellite, i.e. loss of attitude control. If the reactor had begun to tumble, automated boost would be initiated. However, the satellite remained stable. . . .

(2) Depressurization of the reactor. The Cosmos 954 accident in 1978 is believed to have been associated with rapid depressurization of the reactor, perhaps caused by collision with space debris. Cosmos 1900 was designed to automatically boost if such depressurization occurs, but again, 'unfortunately,' there was no depressurization and no resulting boost.

(3) Disruption in the 'energy situation,' i.e. failure in the electrical system. This system likewise was working perfectly, so the automatic boosting mechanism was not activated.

With regard to the first backup system resulting from loss of attitude control, FAS inquired how the boosting mechanism could assure it would boost up to a higher orbit rather than down toward the Earth if the satellite were tumbling. We were told that the allowance for loss of attitude control was very small, a threshold of only a few degrees, before boosting was automatically initiated.

If all of these backup systems had failed, the satellite's orbit would have continued to decay. At an altitude of around 120 kilometers, substantial friction with the air would begin. At about 100 kilometers, that friction would start a signal to eject the reactor core in order to facilitate the disintegration in the atmosphere as it reenters. Temperature is the signal; when friction-induced heat reaches a certain level, the core is ejected. There is no connection between the system to boost the core to a higher orbit and the ejection system for atmospheric burnup should the boosting system fail.

It was asserted by Soviet officials that, even were boosting to fail, there was no risk to the Earth because the radioactive material would burn up in the atmosphere. We made clear that this was not technically correct because radioactive material does not cease to exist by simply being dispersed, that it would ultimately settle down to Earth as radioactive fallout with the potential to induce fatal cancers.

We asked for information on the reactor design, fission product inventory, power and operating history, all of which would be useful in assessing environmental risk and assisting in emergency response measures, should they become necessary, and were assured that such information would be forthcoming.

We further urged the discontinuation of launches of nuclear powered RORSATs and consideration of a ban along the lines proposed by FAS and Academician Sagdeev. We were told that 'if there were an initiative by the US government to in any way make outer space more safe, it will be very seriously considered' by the Soviet government. 'If the US government were to say to the USSR,"Let us consider neither of us launching into outer space nuclear power," and such a matter were to be mutual, it would be very seriously considered by the Soviet side'." ■

KGB, MEET CIA

Would anyone want to take sex-education classes from a virgin? This was the observation which FAS made to CIA's Deputy Director, Robert Gates, when it asked him, immediately after his recent speech on Gorbachev, whether he had ever been to the Soviet Union.

Gates, who has a Ph.D. in Russian studies said "no".

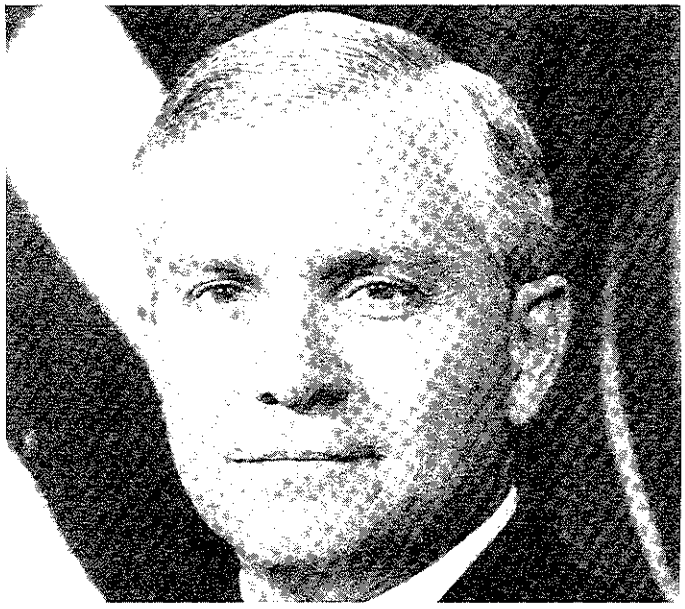
He defended his situation by saying, among other things, that the "welcome mat" was not out, in the USSR for intelligence officers.

A follow-up question was asked: How many of the other high officials of the CIA who helped Gates with that speech were "also virgins?" At this point, the moderator of the AAAS-hosted speech, Sidney Greybeal, intervened saying: "We are not going to permit questions that denigrate Government agencies or speakers". In later conversation, Greybeal indicated that he thought that no intelligence officials were permitted to travel to the Soviet Union and, accordingly, that the question should not be asked! In fact, some non-covert CIA officials have been to the Soviet Union but, probably, not a whole hell of a lot. (Both the Washington Post and the New York Times reported Gates' response).

Non-CIA Officials Increasingly Have Seen USSR

Later that week, at an off-the-record meeting, Defense Secretary Frank C. Carlucci spoke at length, and with enthusiasm about his recent conversations in the Soviet Union with high Soviet officials. Other senior establishment figures rose to recite their own relevant conversations with Soviet figures a few weeks later. It was wonderful to see. Indeed, at the AAAS meeting, itself, Assistant Secretary of Defense Ron Lehman said with the conviction of one who had been there: "Things are happening in the Soviet Union."

To an observer it was only too evident that the CIA risks ceasing to be an actor in the game of interpreting Soviet behavior if it does not get some high-level "in-country" experience. Senators who have had no more than a weekend in the Soviet Union now have more first-hand experience in Russia than the leadership of our eyes-and-ears agency, the CIA.



The CIA's Deputy Director Robert Gates.

After Gates's speech, we asked him if he would visit the Soviet Union if we could arrange his invitation. And, subsequently, we wrote Soviet Ambassador Yuri V. Dubinin asking that he arrange such a visit. The recent highly useful meeting of Chief of Staff Admiral William J. Crowe and Marshall Akromayev are a kind of precedent.

And were Gates to be the guest of the KGB, they do have things that could be discussed. Among them are terrorist activities in the Third World and the rules of the road for intelligence activities between their respective agents.

As far as "welcome mats" are concerned, the U.S. regularly denies visas to Soviet visitors thought to have intelligence backgrounds so the welcome mat is not out here either. This keeps Soviet high-level intelligence analysts blindfolded. Something has to be changed about this situation also. ☐ *—Jeremy J. Stone*

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