

EIR Science & Technology

Soviet Union takes command of space

The Soviets are deploying three new anti-satellite systems and taking a commanding position in international space programs, openly challenging U.S. leadership. Marsha Freeman reports.

The cancellation by the Department of Defense of the U.S. anti-satellite (ASAT) program in February, puts the Soviet Union in unchallenged command of space. In the last world war, control of the skies was the difference between victory and defeat, and in earlier conflicts the critical difference was control of the seas.

Dominance of "this new ocean of space," as John Kennedy described it, will be the controlling factor in any actual or threatened conflicts of the future. If America's early warning satellites in space were knocked out by Soviet ASAT systems, the United States would not know if it were under attack, until it was late in the conflict. One side could win before the fighting war started.

If communications, navigation, reconnaissance, weather, or other civilian and military U.S. space assets were disabled or destroyed in space, the West would have no ability to talk to, deploy, or maneuver troops, ships, or aircraft. No intelligence would be available on which to base making any decisions, including the decision to launch a full-scale nuclear retaliatory strike.

The Soviet sympathizers in the U.S. Congress have tried to convince the American public that the Soviet ASAT system is no threat to the West, ostensibly because the system has not recently been tested, and because the technology is "inferior" to what the United States would use, were it to deploy an ASAT system.

Considering the \$300 billion of cuts over the next five years being recommended by Defense Secretary Frank Carlucci, Congress will now have its chance to move from its victory in stopping the U.S. ASAT program, to shutting down virtually all U.S. military response capability, on land, sea, and air, as well as space.

For the past several years, Congress tied the hands of the Defense Department, preventing the Air Force from testing its air-launched ASAT system. Bowing to budgetary pressures from the White House, the Department has eliminated the ASAT program from the 1989 budget request.

In U.S. polls taken in the past two years, more than 70% of the respondents said they believed the U.S. has an anti-ballistic missile system, and more than 60% said the U.S. has an ASAT system. This kind of lack of public education, and belief in the rantings of duplicitious congressmen and Soviet propaganda, can get us all killed.

In addition to developing and deploying an array of ASAT and strategic defense systems based upon a variety of physical principles in order to take actual command of space, the Soviets have also launched a propaganda and organizing offensive to draw non-communist nations into the fold of the so-called civilian Soviet space program.

In reality, there is no "civilian" Soviet space program comparable to the U.S. National Aeronautics and Space Administration (NASA). According to Soviet space analysts, about two-thirds of the impressive 100-plus Soviet satellites launched each year are for dedicated military missions. According to Gen. John L. Piotroski, head of the U.S. Space Command, over 85% of the Soviet spacecraft orbiting the Earth today are exclusively military systems.

More than 80% of all Soviet space rubles are deployed by the military, and the parts of the manned Soviet space program that are shown on television, represent only about 5% of space resources, and are a "spin-off" of the capabilities that have been developed for national security.

The Soviet challenge to the U.S. in space is to recognize that for the Soviet Union, space is a "theater of military

operations," just like any other, and is secondarily a technology-driver, and a place to show off and garner international prestige.

Since the loss of the Challenger Space Shuttle, and during the virtual shut-down of both the military and civilian U.S. space programs over the past two years, the Soviets have accelerated their offensive to pull the international scientific and commercial space communities into their otherwise unattractive orbit. The West does not have much time left to match, and quickly surpass, what the Soviets can do in space.

First-generation ASAT capabilities

An ASAT system is not only an offensive capability, with which a nation could cripple an opponent and start a war in space. It is also a way of defending space assets from an aggressor. Because the U.S. has no ASAT, the Soviets can attack a U.S. satellite, without the threat of meeting any comparable retaliatory response from the other side, because U.S. satellites cannot defend themselves. If a U.S. space asset were disabled or destroyed, the United States would have the choice of either doing nothing leading to an eventual surrender, or escalating the conflict by perhaps launching its intercontinental ballistic missile force, in a full-scale war.

The Soviets began testing a first-generation antisatellite system over 20 years ago. That crude but effective "kinetic kill" system has been fully tested, and became operational more than a decade ago. It is estimated to be 60-70% effective—not perfect, but certainly capable of doing significant damage not only to single satellites, but even a network of U.S. military satellites.

Using radar guidance, the orbital ASAT hones in on its target and explodes near enough to throw out deadly shrapnel. A second-generation exploding-type ASAT was tested until 1982 by the Russians. This system, which used a more sophisticated infrared homing device and single-orbit pop-up launches, was apparently unsuccessful, and has been put on hold for possible further development. It would be foolish to think that the Soviets have permanently scrapped this more advanced system, as they never throw anything away.

Congressional dupes and traitors have harped on the fact that this operational first-generation system is not 100% effective and is not as sophisticated as the technology the U.S. could develop. One popular criticism is that it can only target and destroy U.S. satellites in low Earth orbit, leaving communications and other assets in higher orbits unthreatened.

However, the height to which the ASAT can be deployed is a function only of the booster used to orbit it, and the Energiya "super booster" test flown nearly a year ago, will be able to place this crude first-generation ASAT within range of any U.S. satellite.

Congress has also stated that since the orbital Soviet ASAT has not been tested for 10 years, it is no longer operational. Soviet space experts have pointed out that the ASAT launch vehicle, the SL-11 booster, launches about five pay-

loads per year to put into orbit radar ocean reconnaissance satellites, and is fully operational.

In terms of the ASAT hunter-killer satellites themselves, according to the Department of Defense, the Soviets have stored a stockpile of ASATs, and could launch several per day at any time, from each of two launch pads at their Tyuratam launch complex. Just because the Soviets do not do full-up testing of their orbital ASAT system does not mean they do not consider it to be operational.

Directed energy ASATs

There is no question that the Soviets see their ability to destroy U.S. satellites as part and parcel of their integrated war-fighting capabilities. Soviet space analyst Nicholas Johnson has pointed out that the last test of the *unsuccessful* second-generation orbital ASAT series was itself quite significant.

When it was launched on June 18, 1982, it was part of the most impressive display of integrated command, control, and deployment of a wide variety of assets ever carried out. In one seven-hour period that day, the Soviets launched two test ICBMs, two anti-ballistic missiles, and one SS-20 intermediate range ballistic missile.

During the same time period, during the "chase" phase of the ASAT test, the Soviets launched two other unrelated satellites, which had never been done before. These two launches represented a test of the quick replacement of Soviet satellites that could have been negated by Allied forces during a military engagement.

Air Force Secretary Edward Aldridge has confirmed that the "Soviets consider their ASAT an integral part of their military force structure and have used it in war exercises on several occasions."

While the Soviets have their orbital ASAT as a proven technology, three other systems also already exist, which "could be used during hostilities today," according to General Piotrowski. The first is the set of Galosh exoatmospheric interceptors that make up one of the ABM systems surrounding Moscow. These nuclear-armed weapons could be targeted against low-orbiting satellites as they pass directly over the Moscow region, killing spacecraft up to about 150 kilometers.

The ground-based lasers at the Sary Shagan test site, which are clearly being developed as a defense against ballistic missiles, have already been blamed for taking "snipes" at U.S. satellites.

In addition, in the fall of 1986 *Aviation Week and Space Technology* magazine reported that French SPOT satellite images confirmed that, "a massive Soviet strategic defense program is under way on a mountain 7,500 feet high, near the Afghan border.

At this mountain top in Nurek, *Aviation Week* stated, laser and possibly microwave facilities were under development, powered by the Brezhnev hydroelectric dam, 10 miles

away. Satellite images revealed three domed buildings, each 33 feet in diameter, believed to be laser mounts. There is also evidence of a station for tracking objects, and pointing the lasers.

A month after this report appeared, syndicated columnists Evans and Novak linked this facility to the blinding of a U.S. satellite using a high-powered microwave transmitter.

These ground-based directed-energy systems would not be able to accomplish a "hard kill" or total destruction of a satellite at an altitude higher than a few hundred kilometers, but they are able to do general component damage to spacecraft up to about 1,000 km. Damage to targeted, specific components could be accomplished, all the way to geosynchronous orbit, 22,300 miles high, which could effectively cover all U.S. military satellites. By transmitting coherent light in specific frequencies, sensors picking up signals from a specific part of the electromagnetic spectrum could be damaged selectively.

The Soviets also have the capability of using electronic warfare, or radio-electronic combat, to jam the uplink and downlink communications between U.S. satellites, and their ground transmitters and control centers. By knowing the operating frequencies of the satellites, the Soviets could even "take over" operational control, by sending false signals and commands to the satellites.

U.S. strategic planners are kidding themselves if they do not recognize that a combined Soviet ASAT-strategic defense capability has the potential to negate virtually all U.S. military capabilities and forces, everywhere on the globe.

The Soviet space 'peace' program

Soviet space policy involves both a carrot and a stick. The stick, of course, is the actual hardware which is poised and ready to both defend Soviet assets, and cripple Allied operations in space. The stick has also had a political component—the threat that if the U.S. did not give up its Strategic Defense Initiative (SDI), the Soviets would encourage world opinion to blame it for "militarizing" space, and would cut off negotiations on everything from "arms control" treaties, to international scientific cooperation.

The carrot is the overture the Soviets are making for Western scientists to participate in their growing space science program, including planetary missions, and for the commercial sector to launch payloads on operational Soviet rockets, while the U.S. rocket fleets are down, or way behind schedule.

The Soviets began their global offensive against the U.S. SDI program soon after it was announced. On Aug. 19, 1983, the Soviet Union submitted to the United Nations a draft of a "Treaty on the Prohibition of the Use of Force in Outer Space and From Space Against the Earth." Remember that the Soviet Union is the only country that has attacked and destroyed satellites in Earth orbit, and tested orbiting nuclear bomb systems.

FIGURE 1



The Soviets launch over 100 satellites per year, most of which are military.

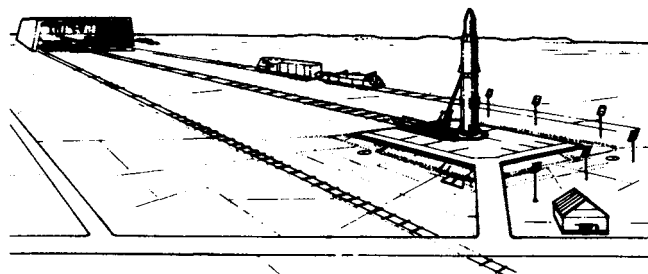
Source: 21st Century Science, Vol. 1, No. 2, May-June 1988.

The treaty draft stipulates that the states that are parties to the treaty undertake, "not to test or deploy by placing in orbit around the Earth or stationing on celestial bodies or in any other manner any space-based weapons for the destruction of objects on the Earth, in the atmosphere or in outer space."

The Soviets have the gall to include a provision that states agree, "not to test or create new anti-satellite systems and to destroy any anti-satellite systems that they may already have." Like their insistence for the past decade that they had no SDI-equivalent program, the Soviets have always maintained that they have no operational ASAT system, and are not developing any new ones.

This ruse of the pot calling the kettle black did not gain

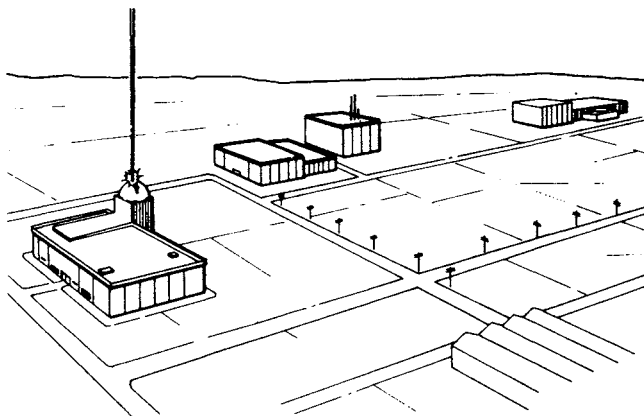
FIGURE 2



The Soviets have two operational launch pads, that can support several anti-satellite launches per day.

Source: Soviet Space Programs 1980-1985.

FIGURE 3



The ground-based lasers at the Sary Shagan test site have both an anti-missile and anti-satellite capability.

Source: Soviet Space Programs 1980-1985.

much support, and these treaties have not been agreed to by the United States. The Soviets continued on their propaganda offensive, and in August 1985 submitted a draft resolution to the U.N. "On International Cooperation in the Peaceful Exploration of Outer Space Under Conditions of Its Normalization."

This treaty clearly counterposed the continuation of the U.S. SDI program to the possibility for international cooperation in civilian space efforts. The Soviets state that "an arms race in outer space which would lead to a sharp intensification of the danger of nuclear war, undermine the prospects for arms limitation and reduction as a whole," would "create insuperable obstacles to the development of international cooperation in the peaceful exploration of outer space."

For the first time, the Soviets floated the idea that the United Nations should establish "a world space organization to collate, coordinate, and pool states' efforts in peaceful space activity."

At the same time, the Soviets submitted, "Basic Guidelines and Principles of International Cooperation in the Peaceful Exploration of Outer Space Under Conditions of its Nonmilitarization." In this draft, they pompously assert that, "right now there is a growing possibility that space may be turned into the source of a terrible danger of war. Plans are being announced and actions are being taken aimed at creating and developing space offensive weapons to destroy targets in space and from space, in the air, and on Earth, including creating a wide-scale ABM system with space-based elements."

In 1986, the Soviets formed the World Space Organization. Academy of Science head Aleksandrov stated just before its formation that its purpose would be, "to coordinate efforts toward international cooperation in surveying and

utilizing space for peaceful purposes."

The Soviets found, however, that this heavy-handed approach was neither going to kill the U.S. SDI program, nor produce an initiative with the United States for space cooperation.

Glasnost in space?

Slowly, the linkage between space cooperation and the SDI began to disappear from Soviet rhetoric, and emphasis turned more seriously to pushing joint U.S.-Soviet missions to Mars. After the aborted Reykjavik summit in 1986, it was clear that there would likely be more attempts at superpower summits and agreements. As preparations got under way for the December 1987 Reagan-Gorbachov summit, the pace of space cooperation negotiations picked up.

Over the past few years, the Soviets have had an aggressive program to recruit U.S. and other non-communist scientists to participate in Soviet space science missions. One not insignificant reason for this push, is the dismal track record of Soviet Mars missions. Over the decade of the 1960s, and up until the NASA Viking missions in 1976, which the Soviets could not match and led to a hiatus in their Mars program, less than half of their Mars probes made it to the red planet. Even fewer successfully returned data.

The Soviets reasoned that one way to upgrade their Mars effort, was to try to entice frustrated U.S. scientists, whose planetary spacecraft sit on the ground waiting for the Space Shuttle and expendable launch vehicles to put them into space, to place their experimental hardware on Soviet planetary spacecraft, and help with the analysis of data during and after the mission.

Since 1984, the focus of the Soviet-coordinated Carl Sagan offensive to work with the Russians, has been to go to Mars together. Sagan has stated on many occasions that there is no scientific value to sending people to Mars, that it would be 10 times more expensive than unmanned missions, and have no economic benefit to the United States.

He has claimed that his Mars peace initiative is the best way to get rid of the SDI, and that if the aerospace industry had billions of dollars for Mars missions, they could convert present facilities from military production.

The original Soviet-Sagan approach, of trying to circumvent NASA and other agencies of the U.S. government, to make private "deals" with individual scientists, has been minimally successful. It became clear to Soviet space scientists that a formal bilateral agreement with the U.S. had become necessary, if significant American participation were to be forthcoming.

On April 15, 1987 Secretary of State George Shultz and Foreign Minister Eduard Shevardnadze signed a bilateral space agreement, covering 16 areas of cooperation (see Table 1). The original 1972 agreement was not renewed by the U.S. in 1982 due to the imposition of martial law in Poland.

The agreement is one of "coordination" between U.S.

and Soviet programs that already exist, and does not initiate any new projects to be carried out jointly by both countries. The Reagan administration has taken a cautious approach to reinstating space detente, on the model of the Nixon-Brezhnev accords.

On Oct. 12, 1987, the NASA Advisory Council Task Force on International Relations in Space released a report titled, "International Space Policy for the 1990s and Beyond." In that report, the Council states that, "The U.S. would not be displaying leadership if it formulated programs designed primarily to beat the Soviets to their announced goals. To do so would merely allow space decisions of the Soviet Union to determine the content of the U.S. space program."

TABLE 1
American-Soviet space agreement

1. Invitation of Soviet co-investigators or interdisciplinary scientists for NASA's Mars Observer mission, and American scientists for the Soviet Union's Phobos and Vesta missions.
 2. Coordination of the Phobos, Vesta, and Mars Observer missions and the exchange of results.
 3. Use of NASA's Deep Space Network for tracking the Phobos and Vesta landers.
 4. Joint studies to identify the most promising landing sites on Mars.
 5. Exchange of data on cosmic dust, meteorites, and lunar materials.
 6. Exchange of data in radio astronomy.
 7. Exchange of cosmic gamma-ray, x-ray, and submillimeter data.
 8. Exchange of data and the coordination of studies concerning gamma-ray bursts.
 9. Coordination of observations from solar-terrestrial missions and the subsequent exchange of data.
 10. Coordination of studies concerning global changes in the natural environment.
 11. Cooperation in the Cosmos biosatellite program.
 12. Exchange of biomedical data from the flights of astronauts and cosmonauts.
 13. Exchange of data from studies of flight-induced changes of metabolism, including that of calcium, from orbital missions and ground experiments.
 14. Feasibility study of joint biomedical experiments, including exobiology, on the ground and in various spacecraft.
 15. Preparation and publication of an amplified second edition of the joint study, "Fundamentals of Space Biology and Medicine."
-

Space policy experts, such as former NASA administrator Tom Paine, have likewise stated that the problem in the U.S. space program is the need for farsighted goals and leadership, and that no joint Soviet project can substitute for a strong U.S. effort.

On Oct. 4, for the 30th anniversary of the launch of Sputnik, the Soviets hosted an International Space Future Forum, with the participation of about 350 non-Soviet or East bloc scientists. Roald Sagdeev, the head of the Soviet Space Research Institute, promised participants that the SDI would not be mentioned during the proceedings.

During the December Reagan-Gorbachov Washington summit, Sagdeev reported to a group of space scientists meeting nearby, that the General Secretary was enthusiastically in favor of joint missions to Mars.

Sagdeev himself, who is fluent in English and a former fusion energy researcher, is an avid supporter of mainly *unmanned* robotic missions to the planets. In a major article in the Dec. 13 *Washington Post*, titled, "To Mars Together—A Soviet Proposal," Sagdeev bowed to U.S. concerns. He states, "We should begin carefully, with unmanned missions. If all goes well with these [precursor] missions, we could try to cooperate in landing men, on Mars, maybe by the year 2001."

He continues: "We should be realistic. If Americans are worried about transferring sensitive military technology to the Soviet Union, we should find ways to work cooperatively, short of fully-integrated missions. For example, we could each send payloads to Mars that would be launched separately from Earth but work together on Mars."

"The cost of these Martian missions would be manageable—far below what our two countries now spend annually on nuclear arms." Unusual that he admitted that the Soviets, as well as the Americans, have nuclear arms!

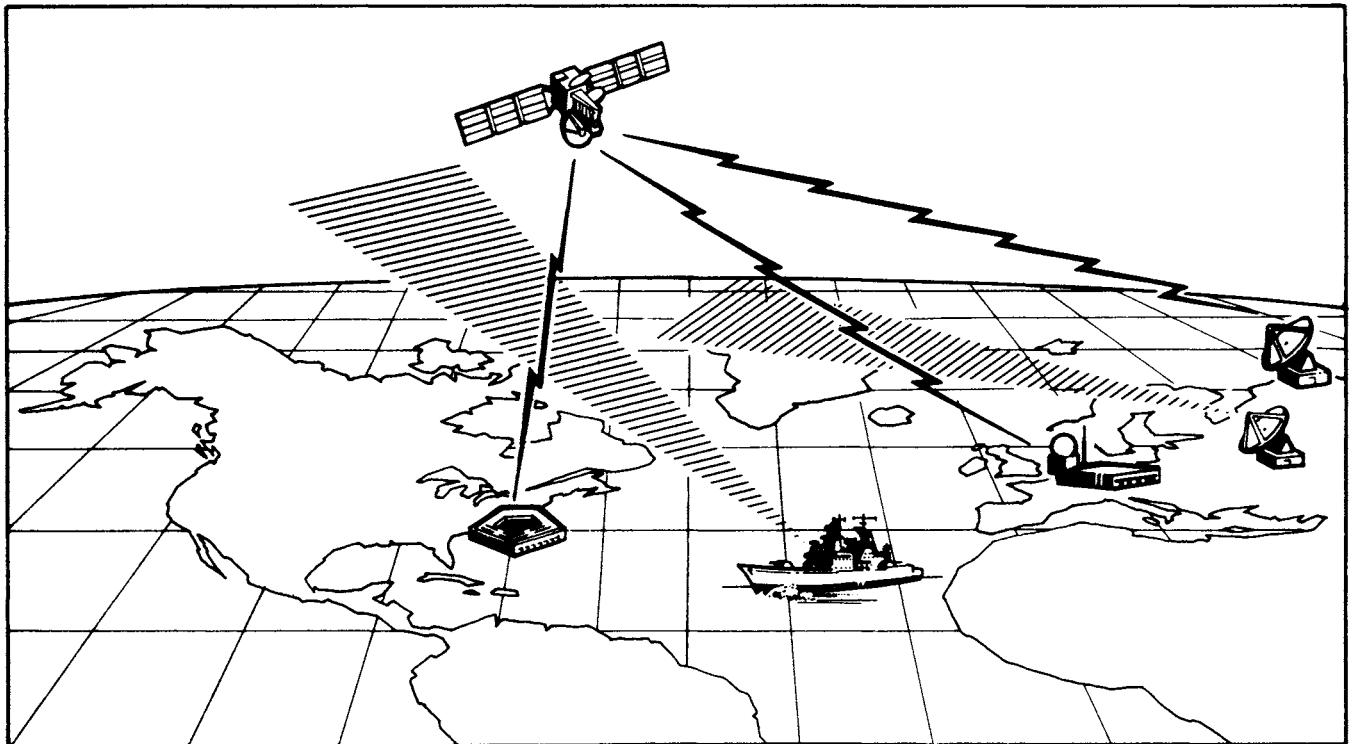
The Phobos mission to Mars that the Soviets will launch this summer, includes the involvement of 14 countries. These include Austria, France, West Germany, Ireland, Sweden, Switzerland, and the European Space Agency, plus some individual U.S. scientists. To prepare for a 1992 or 1994 unmanned Mars mission the Soviets are now planning, they are considering establishing an international advisory committee to help select scientific payload. Already, about 85 proposals have been received, including a first bid from Brazil.

Unless the United States decides to aim, once again, for leadership in the exploration of the Solar System, the Soviets will continue to seduce Western scientists, who have little else to do, into enhancing technologically inferior Soviet space missions.

Soviet 'free enterprise'

During the years that the Soviets were attacking the U.S. for "militarizing space," however, they were coming under increasing criticism themselves from the world community because they did not even *have* a civilian space program.

FIGURE 4



Electronic warfare is a potentially effective anti-satellite technique, which can be used (left to right) to jam uplink communications, jam downlink lines, or even directly take over enemy satellites.

Source: Soviet Space Programs 1980-1985.

Every Soviet launch and mission is controlled by the Strategic Rocket Forces.

In October 1985, after 28 years in space, the Soviets announced the establishment of a new agency, Glavkosmos, to be the point of contact between space vehicle and hardware "manufacturers" in the U.S.S.R. and potential customers, in the West. Glavkosmos is supposed to build and operate manned and unmanned spacecraft, with the military still responsible for launching. Glavkosmos was also charged with negotiating international agreements, which had been formerly handled by Interkosmos, under the National Academy of Sciences.

Beginning in 1986 the Soviets initiated an aggressive marketing campaign, mainly to sell their Proton booster—the world's only operational heavy-lift rocket—to commercial communications satellite customers who could not get their payloads launched on the Space Shuttle, U.S. expendable rockets, or the European Ariane.

With all the West's rockets grounded at least for some amount of time since 1986, it has been a seller's market. In order to woo hesitant customers, the Soviets priced the cost to launch on a Proton at about \$30 million, or between one-third and one-half any comparable vehicle. In the case of experimental equipment that they offer to fly on an unmanned

rocket or even in their Mir space station, they have offered that "costs do not have to be paid in money, but in some cases by sharing finished products or technological equipment."

So far the only taker has been the space program of India, which launched its first remote sensing satellite on a Vostok (SL-3) booster on March 17. The Indian government reportedly paid the Soviets \$6 million for the launch, and this reduced rate was supposedly offered because it was their first commercial payload.

The Soviets have pursued an aggressive marketing campaign. Last May a six-man team from Glavkosmos and Licensintorg visited the United States. They met with satellite manufacturers and federal officials in Washington, Houston, and New York. They also visited France, Japan, and Australia and met with international corporate executives in Geneva.

The Space Commerce Corporation in Houston, run by former L-5 Society lawyer Art Dula, is the U.S. marketing agent for the Soviet Proton booster. Last November Dula and his team traveled to the Soviet Union to take a look at Soviet launch facilities. Out of that trip came an agreement that Space Commerce would guarantee security arrangements for launching Western payloads and transshipping them to the Soviet Union.

Though the agreement mandates that no Soviet officials will inspect payloads while they're being transported in the Soviet Union, the Department of State and other U.S. government agencies are not impressed. The State Department Office of Munitions Control has denied permission for any U.S. company to launch with the Soviets, because it would require the export of sensitive U.S. technology. It would take four years for changes in the regulations to be made. By that time, U.S. expendable launch vehicles, increased flights of the European Ariane, and new capabilities in Japan will obviate the need to even consider the Proton, so in a certain way, the entire point of trying to force this change is moot.

The U.S. ban could kill nearly the entire Soviet marketing effort, since most international satellites are U.S.-made, or contain American components, and these are also banned by U.S. law. The Soviets could get around this by trying to get Third World nations to buy their satellites.

The Soviet launching of commercial satellites has not been greeted with much favorable response in the U.S. Courtney Stadd, the director of Commercial Space Transportation for the Department of Transportation, stated last May that, "the U.S. launch situation is not so desperate that

we have to turn to an adversary state for servicing our commercial payloads." Stadd's office is responsible for facilitating the commercial operation of expendable launch vehicles.

Art Dula, on the other hand, is pushing this "commercial" cooperation with the Soviets for political, as well as financial gain. Dula is quoted in *Defense Daily* September 1987, just weeks before the Reagan-Gorbachov summit, saying that the United States, allowing launches on the Proton would be an extension of current reduced tensions in U.S.-Soviet relations, following progress on the INF talks. On Oct. 11, Dula stated in the *New York Times*, that the Soviets, "want to be capitalists, and we're trying to help them."

Let's be serious. The Soviets want the dollars and other hard currencies the sale of Soviet space services would bring in. If they can steal any Western technology along the way, all the better. They garner international publicity through their efforts, and are integrating U.S. allies and neutral nations into their scientific orbit through their "generous" space science cooperation offers.

Lost U.S. opportunities

The Soviets are also marketing technology and services

TABLE 2

The Soviet move to the West

1981—VEGA planetary mission to Halley's comet announced with participation by scientists from 11 Western nations

July 1985—Proton commercial launches offered to the International Maritime Satellite consortium

Oct. 1985—Glavkosmos is announced, to market Soviet commercial space services

July 1986—West German-Soviet science and technology agreement signed

Jan. 1987—Moscow press conference offering Soviet space services including launches, satellites, sale of remote sensing data, and materials processing in space

March 1987—U.K.-U.S.S.R. Space Agreement signed in Moscow

March-May 1987—Soviet program of Mars missions through the year 2000 announced with Western scientists invited to participate

April 1987—New U.S.-U.S.S.R. Space Agreement signed

June 1987—Comprehensive space exhibit at the Paris Air Show

October 1987—Space Future Forum in Moscow, with people from 30 countries

Ongoing—Aggressive campaign to solicit Western science cooperation and to promote sales of Soviet space services.

Source: "International Space Policy for the 1990s and Beyond," NASA Advisory Council, Oct. 12, 1987.

FIGURE 5

Your Fast Track to the Stars

Your payload just doesn't pay if it's on the ground waiting for launch system problems to be solved. You need a proven, reliable ticket to orbit. We have it: **Proton**.

Since 1970 Proton has maintained a 92% success rate. So, you can be assured of the safety and success of your project.

With the capability of launching payloads of 4,800 pounds directly into geostationary orbits and 44,000 pounds into lower Earth orbits—it launched the MIR Space Station. Proton is the heavyweight international launch vehicle of the U.S.S.R.

- Proven
- Reliable
- Affordable
- Available now

For more information contact:

Space Commerce Corporation
 2000 West Loop South
 Houston, Texas 77058
 Telephone: (713) 777-4321
 Telex: 510 284911
 Space Commerce Corporation

Space Commerce Corporation in Texas is running these ads, to try to attract U.S. industry to launch on the Proton booster.

that the U.S. cannot even compete with, because of the lack of investment in our space infrastructure. In May 1987 the startling news was printed in the *New York Times*, that the U.S. Geological Survey was interested in buying remote sensing images from the Soviet Union.

The Soviet trade agency Soyuzkarta was offering images with a resolution of 16 feet. Images produced by the French SPOT satellite give a 33-foot resolution, with the U.S. Landsat coming in a poor third, at 98 feet. It was revealed that the USGS had sent a letter to the agency in October 1986, and that in addition to being of a high quality, the images were also cheaper. A \$46 Soviet Cosmos photo would cost \$170 from Landsat, and \$400 from SPOT.

According to *Aviation Week*, last July the Soviet Soyuzkarta trade agency started its marketing campaign, and the chief Soviet cartographer, V. Yashchenko stated that Syria bought some photos, and that interest had been expressed from Australia, Kuwait, Angola, North Korea, Vietnam, and East Germany.

For years, NASA and U.S. satellite manufacturers had been limited to the 98-foot resolution for Earth remote sensing satellites by Defense Department restrictions growing from concerns that photos that could show U.S. military assets would be available commercially.

That concern has been made irrelevant as other nations can now sell better pictures, with no restrictions. Therefore, at the end of January, the White House announced that it was dropping the restrictions on U.S. data resolution. The problem is that there is no spacecraft ready to replace the current Landsat technology, and due to administration "commercialization" policies, there may never be.

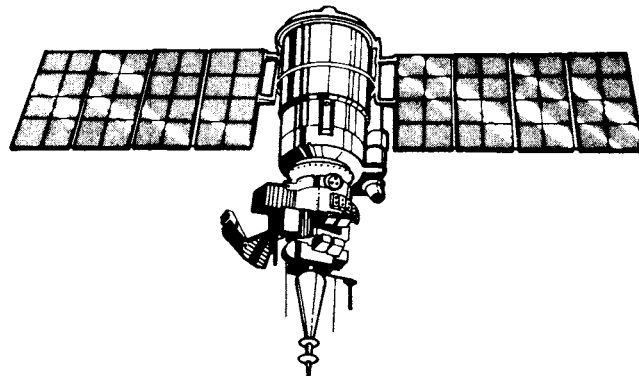
On Dec. 26, the Soviets launched Cosmos 1906. This new-generation of remote sensing spacecraft had multi-channel cameras, produced panoramic views in the visible and infrared parts of the electromagnetic spectrum, had a new space-to-Earth data transmission system, and could cover 40,000 square meters instantaneously. In 10 minutes, the satellite photographs 1 million kilometers.

Of course, even the Soviets have problems in their space program. On Feb. 22, *Aviation Week* reported that Cosmos 1906 was deliberately blown up in orbit on Jan. 31, because it had malfunctioned.

Another important area of space research where the Soviets have no competitor is in long-duration manned operations. U.S. space scientists have not been able to run experiments in materials processing, for example, for the past two years that the Space Shuttle has been down.

On Feb. 21, the *New York Times* reported that Payload Systems, Inc. in Wellesley, Mass. had been cleared by the Defense and Commerce Departments to place a crystal protein growth experiment on the Soviet Mir space station. The company, founded in 1984 by Dr. Byron Lichtenberg, has helped companies design experiments for the Space Shuttle, and zero-gravity aircraft flights.

FIGURE 6



This Meteor-Priroda satellite, which had a resolution similar to the U.S. Landsat system, has recently been replaced by more sophisticated technology.

Source: Soviet Space Programs 1980-1985.

The company contracted with the Soviets one year ago on behalf of a pharmaceutical company, and in October applied to the Commerce Department for a license. Dr. Anthony P. Arrott, research director of the company, explained to the *Times* that, "protein crystallization can take weeks or months." For that reason, the Mir will be an attractive option for them, even when the Shuttle is flying.

Over the next year, a second French astronaut will fly to a Soviet space station. Last month, Glavkosmos signed a contract with the West German Kaiser Threde Company to orbit three experiments on a recoverable unmanned capsule. In 1989, the Soviets will place their 50-60 kilogram payload in a Photon capsule, which can spend between 14-30 days in orbit, and is then returned to Earth.

In 1990 the German firm will supply a 100 kg payload, and a 150 kg payload the following year. The advertised charge is \$8-10 million for the full 500 kg capacity of the Photon capsule, but again the company is getting a "special introductory price."

The Soviets are out-pacing the United States in offering these "commercial" services to frontier industries, not because they are so far ahead, but because we are so far behind.

This situation is not one that cannot be remedied by a willful intervention to change U.S. policies. It is also not unrelated to the military superiority that the Soviets have amassed in space. Just as their overall strategic position is only enhanced by the collapse of the economies of the West, integration of leading-edge scientific manpower and hardware into the Soviet space program also enhances their strategic position.

The Soviets are now in an unchallenged position of superiority in space. How long they remain there is up to the United States.