Energia: Soviets take the lead in rocketry

Marsha Freeman reports on the nature, and the awesome strategic defense implications, of the Soviet Union's new superbooster.

"Now the Soviets can put anything they like in Earth orbit," remarked Dr. Tom Paine, in response to the May 15 launch of the *Energia* booster from the Baikonur Cosmodrome. Paine, who was the head of the U.S. space program at the time of the first manned lunar landing in 1969, pointed out that, "The *Energia* has the same lift capability as the Saturn rocket that took us to the Moon," and that this feat changes the entire international balance-of-launch capabilities, for the first time in 20 years.

It is not astonishing that the Soviet Union finally launched a Saturn V-class booster this past month—they have been working on one for at least 22 years; in terms of its military application, it is, however, quite frightening. What *is* astonishing was the complete silence from Secretary of Defense Weinberger, the White House, and the SDI office, in response to this new development.

Since 1981, when the Pentagon started publishing its *Soviet Military Power* report, they have been warning that a Saturn V-class booster would give the Soviets a significant jump ahead of the United States in being able to launch and orbit laser weapons to attack satellites, and battle stations for strategic defense. When the day for the first flight test finally arrived on May 15, 1987, no one in the White House seemed to be interested.

On May 16, TASS described the new capabilities of *Energia* by stating, "It opens up a new stage in the development of Soviet space rocket engineering and broad prospects for a peaceful exploration of outer space." No one should be fooled, however, into thinking that the Soviets have developed *Energia* for the "peaceful exploration of space."

James Oberg, noted for his analyses of Soviet space programs, stated in the May 18 *Washington Times* that the Soviets could keep the United States out of space with their new heavy rocket. "A few payloads like this [i.e., 100 tons each] would allow the Soviets to set up an orbiting battle station system and to deny space to any payloads that did not meet their approval." Such battle stations, he said, could be armed with lasers, small missiles, fragmentation bombs, or satellite warheads.

"Only three or four *Energia* payloads would be enough to set up an effective anti-satellite network," he said, which "could attack any satellite within a few orbits and enforce their own 'export controls' on it. . . . It is impossible to overestimate the importance of the Soviet achievement. For the first time in 25 years, they have resumed the lead in rocket power with the obvious intention of using it."

The May 20 issue of the *Defense Daily* newsletter also attempted to set the record straight on the Soviets' intentions. It stated that *Energia*, "is not a launcher just to provide competition with the United States' NASA Space Shuttle civilian flight demonstrations, although that is certainly one of its objectives. . . . The *Energia*, more than anything else, is a window of significant potential for expansion of the Soviet military into space. . . . Its contribution to the eventual construction of Soviet battle stations in orbit cannot be overemphasized, especially at a time when it flies in the face of a confused and misdirected congressional leadership that would bind the hands of the United States' quest for a strategic defense system."

The May 19 issue of the Italian daily *La Stampa*, accurately headlined its coverage of the *Energia* launch: "Maxi-Missile for the Soviet SDI." They state: "With the *Energia*, the balance between the two superpowers has changed. . . . It is easily understood that the same missile can put into space anything needed for a space shield: lasers, directed mirrors, spy satellites."

No civilian Soviet space program

A grave mistake is made by newspaper reporters and commentators in the West regarding the Soviet "space program." Many try to compare what the Russians allow them to see on Soviet television, to the NASA space launches they watch at home. What the world sees on Soviet television, is a very small percentage of the actual capabilities the Russians have in space. The vast majority of their resources and systems are for use by the military. Their civilian science, exploration, and technology programs are mainly a spin-off from their strategic capabilities, and are used to maximum political effect.

The Baikonur Cosmodrome is often compared by Western journalists to NASA's Kennedy Space Center in Florida. However, the Soviet Air Force is responsible for all cosmonaut training, the Strategic Rocket Force conducts all space launches, and the three major Soviet launch sites are administered by the military. Unlike any of the NASA space facilities, what goes on at these centers is secret, unless the military releases the information.

The Soviets do not need the *Energia* rocket to expand or supply their *Mir* space station. Nor is there any serious evidence that they need that 100-ton lift capability because they are imminently planning to send men to the Moon or Mars.

There is, however, every reason to believe that the strategic defense and anti-satellite programs they have been developing for the past 20 years, require this next-step launch capability to place next-generation directed energy systems into space. Without a leap into large booster technology, more advanced Soviet military space systems could not be deployed.

The failed first try

On Oct. 4, 1957, the world was stunned by the news that the Russians had succeeded in placing a small satellite into orbit around the Earth. Less publicity, however, was afforded the precursor to that event a month before, which was the Soviets' (and the world's) first successful launch of an ICBM (intercontinental ballistic missile). The Sputnik launch was an ICBM with a satellite on top.

The United States, too, depended upon its military rocket vehicles for the first few years of the space era, but when President Kennedy announced in 1961 that the United States would go to the Moon, an enormous rocket had to be built to accomplish it, though there was no planned military mission for such a rocket at that time.

In 1964, NASA administrator James Webb announced that the Russians were working to develop a booster with a capability comparable to the Saturn V rocket that astronauts would take to the Moon. Mockingly known as "Webb's Giant," the booster was estimated to have between 10-15 million pounds of thrust using conventional petroleum-based fuels, compared to the planned 7.5 million for the Saturn V. Webb estimated that the Soviet rocket would carry a smaller payload than the Saturn V, though it would be much larger, because it would use less efficient fuels, rather than the liquid hydrogen carried in the second and third stages of the Saturn. This superbooster was dubbed in the West the G-1 rocket.

But the Soviets could not compete with a mobilized United States on a giant civilian booster project. According to James Oberg, in his 1981 book, *Red Star in Orbit*, a briefing by the Central Intelligence Agency in 1976 confirmed that the first big booster test in early June 1969 (one month before Apollo 11) exploded on the launch pad. This was apparently caused by a fire in its upper stage, and probably resulted in casualties.

A second test in the summer of 1971 ended in an in-flight explosion when the first stage malfunctioned, and this was repeated on Nov. 24, the following year. The G-1 booster under development by the Soviets in the 1960s was undoubtedly designed for their lunar program, though for years there has been a debate over whether or not the Soviets were indeed in the race to place men on the Moon, as the "sour grapes" Russians denied they were in the Moon race, since they lost it.

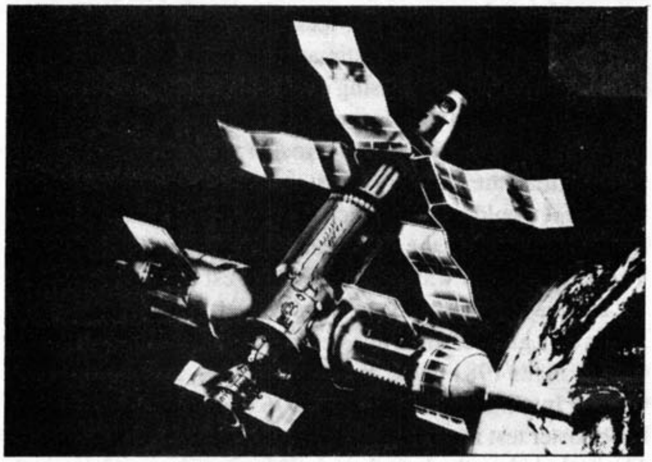
As close to the Apollo 11 lunar launch (July 16, 1969) as June 2, Soviet veteran cosmonaut Alexei A. Leonov (the first man to "walk" in space) stated to a group of Japanese science correspondents in Moscow, "If everything goes well, it will be possible for Russia to send a man or men to the Moon before the end of this year or early in 1970" (reported by Kyodo news agency).

However, in October, three months after Neil Armstrong and Buzz Aldrin walked on the Moon, Soviet Academy of Sciences head Mstislav Keldysh stated, "At the moment, we are concentrating wholly on the creation of large satellite stations. We no longer have any scheduled plans for manned lunar flights." It was clear to the West, that the Soviets gave up in the race to the Moon because they could not develop the huge launch capability necessary to take men out of Earth orbit.

The reworked G-1

In 1971, the Russians launched their first *Salyut* space station, on their workhorse Proton booster. This rocket has a maximum payload delivery capability of about 44,000 pounds to low Earth orbit, compared to the 300,000-pound payload of Saturn V. Each of the eight Soviet stations launched in the past 15 years, including the current *Mir*, have been about the same size (40,000 pounds) and all were launched on Proton

FIGURE 1



The Soviet Mir *space station is the same approximate size as previous* Salyut *stations, with the new capability to dock up to six other spacecraft to it to form an orbital complex.*

boosters (**Figure 1**).

But in 1980, after eight years of silence about a super booster, U.S. intelligence again reported that a huge new booster was under development. It was assumed that the G-1, with some improvements, was back on the agenda. It was posited at that time that a permanently manned space station, which the Soviets said they would orbit by the mid-1980s (*Kosmograd*), weighing perhaps 220,000 pounds, would require the big booster. *Aviation Week and Space Technology* magazine speculated in that year that the first launch would be in 1983, and the booster would be operational for the space station launch by 1985.

With the launch of the *Mir* on Feb. 20, 1986, the idea that the Soviets were developing a big booster just to deploy civilian space stations went out the window. The *Mir* station central core is essentially the same size as the former *Salyuts*', but with six docking ports, rather than only two (**Figure 2**). The largest space station to date that has ever been launched remains the U.S. *Skylab* in 1973, which took advantage of the Saturn rocket's huge payload capability.

The Soviets have never seen their "man-in-space" program as a "civilian" program. At least two of the *Salyut* stations launched in the program have been strictly military, and the lack of U.S.-comparable electronic, computer, automation, and navigation systems has required that they have people in space simply to do many of the things the United States has developed the technology to do without people.

The United States decided to give up its military manned space program, the Manned Orbital Laboratory and the Dynasoar shuttle program, in the 1960s. The Soviets decided that this orbital capability would be important to test new space technologies, do reconnaissance missions, and perhaps repair critical orbital military assets, when that capability is developed. Considering the poor record the Russians have in the long-duration functioning of electronic equipment, it is highly likely that a man-in-orbit function will be required when strategic defense assets are ready to be deployed by *Energia*.

The Soviets opted for building their *Kosmograd* last year, by attaching modules to the central *Mir* core, delivered by the Proton rocket, and have succeeded this year in docking three other modules to the *Mir* at the same time—the *Soyuz TM* spacecraft that delivered the cosmonauts, an unmanned *Progress* supply ship, and the *Quantum* astrophysical module for scientific research.

In 1981, the first Pentagon issue of *Soviet Military Power* suggested a more plausible mission for the superbooster. Cognizant of the Soviet ASAT capability, and the push for directed-energy systems for more advanced capabilities, the report states: "A very large space booster similar in performance to the Apollo program's Saturn V is under development and will have the capability to launch very heavy payloads into orbit, including even larger and more capable laser weapons." Figure 1 depicts the Defense Department's speculated picture of the superbooster.

One can choose to believe anything the Russians say, but there is no indication that *Energia* was built, over a period of 22 years, at a cost of billions of dollars, and with loss of human life, to put up space stations that are actually being built with Proton boosters.

Are cosmonauts going to Mars?

There is no question that the Soviets have an aggressive program for the exploration of the planet Mars, but is this why the *Energia* was developed? On May 21, R. Kremnev of the Glavcosmos, the "civilian" agency of their space program, announced a three-phase unmanned Mars program. In 1992, the Soviets plan to send a balloon-type system through the atmosphere of the red planet.

Two years later (the Earth-Mars launch "window" occurs once every two years, with today's technology), Kremnev said, the Soviets will send a small rover to Mars, with a range of 200 kilometers, with a larger one to follow. In 1996 or 1998, a complicated unmanned soil sample return is in the works, which would gather between 500 grams to 3 kilograms of soil from various sites, and return the samples to Earth.

But the Soviet space program does not have an impressive record in terms of successful Mars missions. More than half have failed either en route, or once they reached the planet. Most important, cosmonauts have never ventured past Earth orbit, and there is no indication that the radiation protection, extended life support, navigational, or other systems required, have been developed to take them even to the nearby Moon.

Lunar manned travel is a definite prerequisite to a conservative, reasonable-risk manned Mars mission. While it is true that the Russians have had no big booster that could take them to the Moon the way the United States went, their years of operational Earth-orbiting space stations, have provided an ideal launching pad for trips to the Moon, and then Mars. The Soviets could have sent a manned mission to the Moon by now, if that were their priority.

When the Apollo astronauts left Cape Canaveral, they took everything with them they needed to get to the Moon, and back. The United States made the decision, opposed by many, to do this direct flight mission, requiring a superbooster, because it was estimated that building operational space stations first would not allow NASA to meet Presdient Kennedy's "before this decade is out" deadline.

But the Soviets have had space stations in orbit for the past 15 years—plenty of time to collect and assemble the material needed to send men to the Moon. It appears, again, that the military leadership of the Soviet space program has had more pressing, top-priority projects under development than missions to the Moon.

The only country with bombs in space

What were the Soviets doing, while the United States was sending astronauts to the Moon, and unmanned probes to the outer planets? At the present time, the Soviet Union is the only nation with an operational anti-satellite (ASAT) capability, and the demonstrated ability to orbit nuclear bombs.

On Sept. 17, 1966, the Soviets started conducting a series of tests with their Kosmos satellites, "with odd trajectories." Instead of going into orbit, these vehicles arced far above the altitude normal for reconnaissance satellites, and then fell back to Earth, without completing a full orbit.

In January 1967, the Soviets did their first test of what became known as the Fractional Orbital Bombardment Sys-

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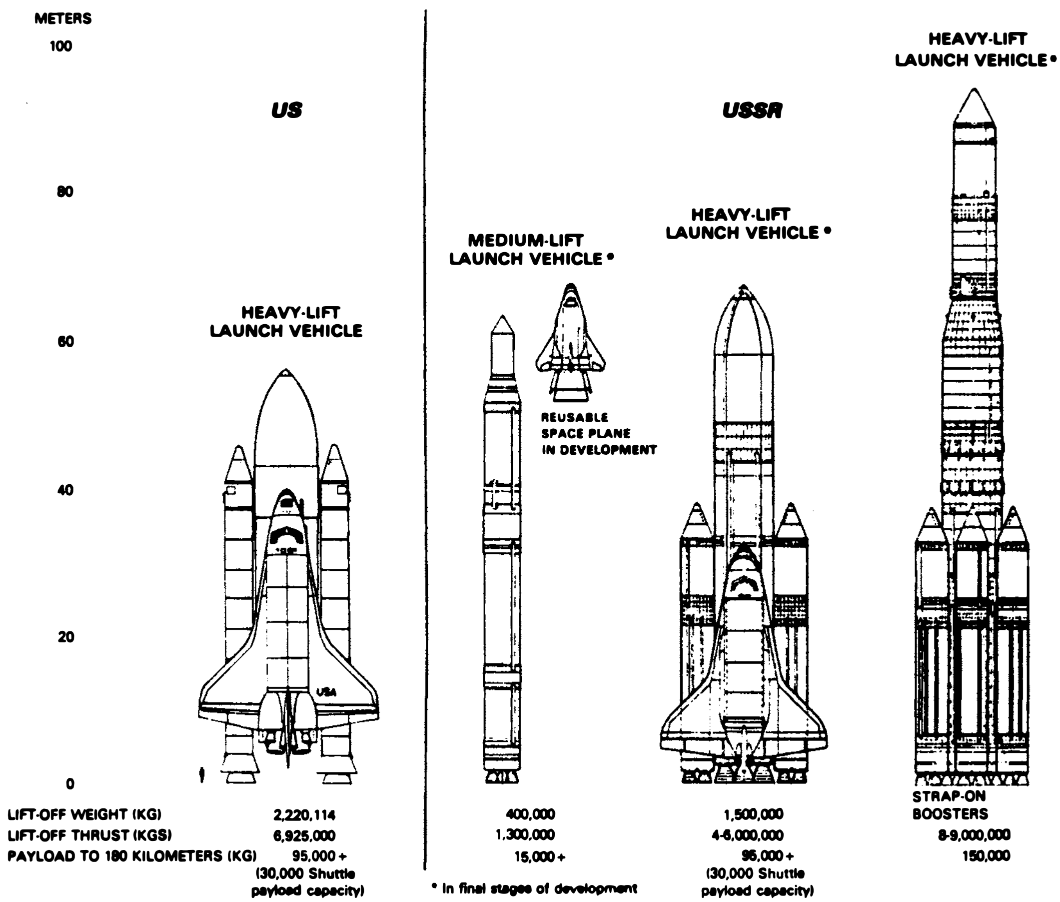
FIGURE 2

New U.S. and Soviet space launch vehicles



Until the launch of the Energia, *the Department of Defense assumed that the Saturn V-class heavy-lift launch vehicle under development (extreme right) would be nearly 100 meters tall, with six strap-on boosters, to orbit 150 metric tons. The use of liquid hydrogen engines made it possible to make the booster 60 meters tall, with four boosters. (From* Soviet Military Power, *1984, p. 44.)*

Continued from page 21
tem (FOBS). In November that year, Defense Secretary Robert McNamara held a hastily called press conference, and revealed that the FOBS was designed to drop a nuclear bomb on a target from outer space, within a fraction of a single Earth orbit.

The goal of FOBS, the Defense Department stated, was to circumvent America's first line of defense against a Soviet ICBM assault, the Distant Early Warning or DEW line series of radars. The DEW radars were aimed along the United States' northern horizon to spot missiles traveling along the great circle route, on their way to U.S. targets. The FOBS could potentially be launched east-to-west, rather than the conventional west-to-east which takes advantage of the Earth's rotation, and "sneak up" on the United States by evading the DEW line altogether.

Even if the missiles came along the great-circle route, because the FOBS soared to a 1,120 kilometer altitude, by

TABLE 1
Major offensive Soviet military launches (1957-80)

Spacecraft	Date	Mission
	Aug. 3, 1957	First ICBM
Polyet 1	Nov. 11, 1963	Maneuverability test
Polyet 2	Apr. 12, 1964	Maneuverability test
Kosmos ?	Sept. 17, 1966	Possible FOBS test, failed
Kosmos 139	Jan. 25, 1967	FOBS test
Kosmos 160	May 17, 1967	FOBS test
Kosmos 169	July 17, 1967	FOBS test
Kosmos 170	July 31, 1967	FOBS test
Kosmos 171	Aug. 8, 1967	FOBS test
Kosmos 178	Sept. 9, 1967	FOBS test
Kosmos 179	Sept. 22, 1967	FOBS test
Kosmos 183	Oct. 18, 1967	FOBS test
Kosmos 185	Oct. 27, 1967	Possible ASAT precursor test; failed
Kosmos 187	Oct. 28, 1967	FOBS test
Kosmos 217	Apr. 24, 1968	ASAT precursor, never reached orbit
Kosmos 218	Apr. 25, 1968	FOBS test
Kosmos 244	Oct. 2, 1968	FOBS test
Kosmos 248	Oct. 19, 1968	Target for ASAT
Kosmos 249	Oct. 20, 1968	ASAT, passed near 248 and exploded
Kosmos 252	Nov. 1, 1968	ASAT, passed near 248 and exploded
Kosmos 291	Aug. 6, 1969	ASAT test, probably failed
Kosmos 298	Sept. 15, 1969	FOBS test
Kosmos 354	July 28, 1970	FOBS test
Kosmos 365	Sept. 25, 1970	FOBS test
Kosmos 373	Oct. 3, 1970	Target for ASAT
Kosmos 374	Oct. 23, 1970	ASAT, approached 373 but exploded later
Kosmos 375	Oct. 30, 1970	ASAT, approached 373 and exploded
Kosmos 394	Feb. 9, 1971	Target for ASAT
Kosmos 397	Feb. 25, 1971	ASAT, passes 394 and explodes
Kosmos 400	Mar. 18, 1971	Target for ASAT
Kosmos 404	Apr. 4, 1971	ASAT, passes near 400, deboosted into Pacific
Kosmos 433	Aug. 8, 1971	FOBS test
Kosmos 459	Nov. 29, 1971	Target for ASAT
Kosmos 462	Dec. 3, 1971	ASAT, approaches 459 and explodes
Kosmos 521	Sept. 29, 1972	Target for ASAT, no sign of interception
Kosmos 803	Feb. 12, 1976	Target for ASAT
Kosmos 804	Feb. 16, 1976	ASAT, approaches 803; deboosted into Pacific
Kosmos 814	Apr. 13, 1976	ASAT, approaches 803 and deboosted
Kosmos 839	July 14, 1976	Target for ASAT
Kosmos 843	July 21, 1976	ASAT, failed
Kosmos 880	Dec. 9, 1976	Target for ASAT
Kosmos 886	Dec. 27, 1976	ASAT, approaches 880, and exploded
Kosmos 909	May 19, 1977	Target for ASAT
Kosmos 910	May 23, 1977	ASAT, intended for 909; result unclear
Kosmos 918	June 17, 1977	ASAT, approaches 909, plunges into Pacific
Kosmos 959	Oct. 21, 1977	Target for ASAT
Kosmos 961	Oct. 26, 1977	ASAT, approaches 959, plunges into Pacific
Kosmos 967	Dec. 13, 1977	Target for ASAT
Kosmos 970	Dec. 21, 1977	ASAT, approaches 967 and explodes
Kosmos 1009	May 19, 1978	ASAT, approaches 967, plunges into Pacific
Kosmos 1171	Apr. 3, 1980	Target for ASAT
Kosmos 1174	Apr. 18, 1980	ASAT, approahces 1171, explodes a day later

This table does not include the reconnaissance, communications, navigational, and other Soviet military satellite launches, which occur frequently and at regular intervals, but only the missions which tested new offensive military space capabilities.

the time it were picked up on the DEW line radars, it would be only about 700 kilometers away from the target. At this distance, there would be only a three-minute warning.

McNamara also pointed out that a high-yield nuclear warhead set off several hundred kilometers above the United States would generate a titanic electromagnetic pulse, knocking out power and communication lines throughout North America.

The signing of the Outer Space Treaty in 1967, which prohibited the placement of "weapons of mass destruction" in outer space, did not deter the Soviets from continuing the testing of their FOBS system. At least 15 tests were conducted between 1967 and 1971 (see **Table 1**). By that time, it is likely that since the United States had developed reconnaissance satellites that could detect any Soviet missile lift-off, the FOBS system had no great advantage as an offensive ICBM capability.

The Soviets had begun to develop the capability to maneuver spacecraft in orbit as early as 1963, according to William Shelton, in his book, *Soviet Space Exploration*. At that time, Soviet spokesmen stated that this capability would be used for assembling space stations and ferrying orbiting crews, but for three years, there were no manned flights using this maneuverability.

Shelton states that, "By 1965, Russia had announced that it already could place nuclear bombs in orbit." Soviet Col. Gen. V.P. Tolbubko stated: "Powerful missiles are being created that can ensure delivery to the target of nuclear warheads, both on ballistic and orbital trajectories, and that are capable of maneuvering within that trajectory." Elimination of the FOBS system was one of the requirements of the now-dead SALT II treaty, but like the majority of treaty requirements, the Soviets never honored that agreement.

Anti-satellite weapons

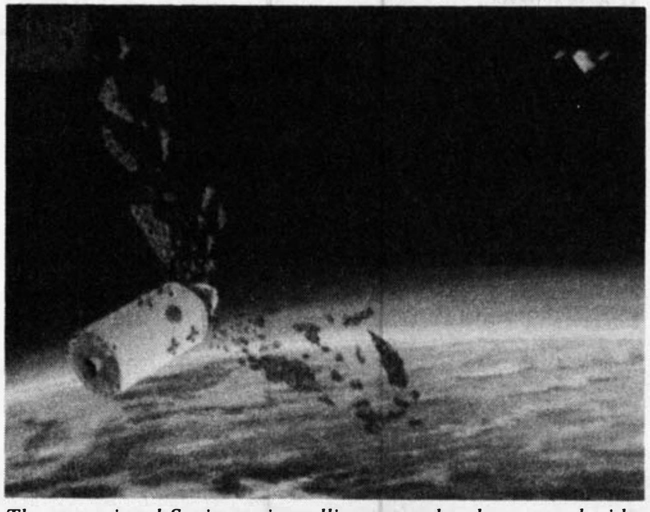
At the present time, only the Soviet Union has willfully destroyed satellites in orbit. The first-generation Soviet ASATs became operational in the mid-1970s. Using radar guidance, the ASATs demonstrated the capability, with an 85% success rate, to close in on a target and explode near enough to throw out deadly shrapnel. Not terribly sophisticated, but highly effective (**Figure 3**).

Recent improvements, such as single-orbit pop-up launches and optical infrared homing devices, were not as successful, but third-generation directed-energy systems are now under development.

In the fall of 1985, American physicist Edward Teller stated on television, that the gas dynamic and iodine lasers based on the ground at Sary Shagan had become operational. As early as 1982, *Air Force* magazine reported that a ground-based Soviet laser had used the *Salyut* space station as a tracking target and that the cosmonauts were apparently told to put on goggles to protect their eyes from the laser light.

FIGURE 3

Operational Soviet ASAT



The operational Soviet anti-satellite system has been tested with an 85% success rate. The ASAT simply explodes, as seen here, hurling deadly shrapnel toward any other spacecraft within range. (From Soviet Military Power, *1985, p. 54.)*

According to James Oberg, the Soviets can use this capability to blind U.S. satellites and destroy their optical sensing systems. The Pentagon has estimated that the Soviets could deploy space-based lasers for ASAT applications in the 1990s. To do that, they will need the capabilities of the *Energia* rocket they have just tested.

The Soviets have never admitted that they have an ASAT capability. They have repeatedly castigated the United States for trying to finally develop ASAT weapons, and have served as the moral and more direct support for the congressional grouping that has held up U.S. ASAT testing for the past 18 months.

One of the flags waved by congressional ASAT opponents, is the fact that the Soviets have only tested their system against satellites in low Earth orbit (less than 300 miles above the Earth) (**Table 2**). In order to launch a killer satellite to chase and destroy a U.S. navigational or communications satellite tens of thousands of miles high, a more capable rocket than the Proton would be required.

The Proton can carry about 10% of its low-Earth orbit payload into geosynchronous orbit (GEO) 22,300 miles above the Earth. But that 2-ton GEO capability cannot deliver a 3-4 ton ASAT into that high an orbit. If the *Energia* can carry a comparable 10% of its 100-ton low-Earth orbit payload to GEO, the Soviets can place a 10-ton spacecraft in the vicinity of a large number of U.S. military satellites.

Now the Soviets have the launch capability they need to threaten all U.S. military space assets.

TABLE 2

Payload capability of U.S. and Soviet rockets

(1,000s of lbs.)

Launcher	Payload to LOE[1]
U.S. vehicles[2]	
Delta	5
Atlas Centaur	8
Titan 34D	10
Shuttle	65
Soviet vehicles	
A-2 (Soyuz)	16.5
Proton D-1	44
Proton D-1-h (Salyut)	49.5
U.S. Apollo-era vehicles	
Saturn-1B	40
Saturn-V	300

[1]Low-Earth Orbit = 300 miles. The Titan 34D can launch 27,000 lbs. to a 100-mile orbit.
[2]Vehicles rarely ever launch their maximum payload, including the shuttle.
Source: NASA.

Where did they get the technology?

According to TASS reports, released a week after the *Energia* test flight, the four probably multi-chamber engines in the first stage of *Energia* are powered by liquid hydrogen. The four liquid strap-on boosters are kerosene fueled.

For 25 years, the Soviets have been unable to master liquid hydrogen technology. This light and plentiful element must be kept at −423°F to be in a liquid phase, and is not only flammable but explosive when exposed to the air or oxygen in an uncontrolled manner. In the *Challenger* disaster, it was the breaching of the liquid hydrogen fuel tank that produced the spectacular explosion seen on television, not the leak from the solid rocket booster.

As early as the turn of the century, space pioneers recognized that the superior, liquid hydrogen fuel would be needed to propel unmanned spacecraft to the outer planets, and to take crews past the Earth. In the measure of rocket fuel efficiency, known as specific impulse, hydrogen is nearly twice as efficient as petroleum-derived fuels, though its mass is much lighter.

Liquid hydrogen was proposed for the upper stages of multi-stage rockets, to provide the higher escape velocity to the payloads that had already made their way into Earth orbit. The heavier fuels are used in U.S. and Soviet military vehicles, and the Saturn rockets for the first stage, when the spacecraft is pulling against the strong gravitational force of the Earth.

Peenemünde veteran and space scientist Krafft Ehricke began to investigate the possibilities and problems of liquid hydrogen for rocket propulsion during the Second World War. Two months after the launch of Sputnik in 1957, Ehricke presented a proposal to the Air Force to build the Centaur liquid hydrogen-fueled upper stage, to increase the payload capability of the Atlas ICBM.

In 1959, the Centaur program was transferred to the newly-formed National Aeronautics and Space Administration, and in 1962, the United States tested the world's first liquid hydrogen upper stage. The Centaur was put atop the Atlas, and later the Titan missile, and was used to launch NASA's planetary probes. A modified Centaur engine became the basis for the two liquid hydrogen upper stages of the Saturn V, that took men to the Moon.

Handling liquid hydrogen a few degrees above absolute zero required the development of safe and sophisticated cryogenic technologies, which the Russians could not master until very recently. The propulsion configuration of the *Energia* is eerily similar to that of the Space Shuttle, which also uses liquid hydrogen engines alongside external boosters, in the first use of this higher-energy fuel in the first stage of the rocket.

How did the Russians make this "great leap forward" in propulsion technology? Quoted in the May 18 *Washington Times,* Oberg remarked that the Soviets had somehow managed to "skip over" many years of testing and development (and failures) of these advanced engines, which took the United States 25 years to develop. "This is evidence of either divine intervention, or their ability to use Western experience," Oberg remarked. "It is a tribute to their rocket engineers and to the GRU and the KGB," he stated.

Similarly, the *Defense Daily* of May 19 commented, "The use of liquid hydrogen in the *Energia* launch would mark a major breakthrough for the program and is seen as a tribute in a large measure to the KGB technology transfer department." Perhaps this is what Soviet leader Mikhail Gorbachov means by *glasnost*.

The same eerie feeling is even more striking in the Soviet space shuttle program. Why spend years doing wind tunnel testing and aerodynamic design, when you can build yours just like the one that already works, Soviet designers must have asked themselves.

Not until recently did the Soviets admit they are developing a reusable spacecraft, though Western intelligence agencies have actually photographed a small, scaled-down version of the Soviet shuttle, as we show on the cover of this issue. The Russian shuttle is apparently made up of only an orbiter that is reusable. The glider, without engines, will be launched strapped on to the *Energia*-class expendable rocket and most probably has half of the payload capability of the U.S. system. In that sense, it is similar in design to the small Hermes shuttle being developed by the French, which will be launched atop an upgraded expendable Ariane rocket.

Unlike the U.S. plan to use the Shuttle to bring crews and supplies to the space station, the Soviets have developed a well-oiled system for station resupply, using unmanned *Progress* ships for consumables and equipment, and the tried-and-true *Soyuz* for crew delivery and highly publicized "guest cosmonaut" visits.

The U.S. military is now deciding whether or not this nation should also have a space station complex, explicitly for national security missions. The foolhardy short-sightedness of military planners, plus the budgetary sabotage by the Congress of DOD and SDI space initiatives, has left only the Soviet Union with military commanders in space on a full-time basis.

Could we catch up?

We've done it before. In 1960, during the presidential campaign, John F. Kennedy charged that the Eisenhower administration was responsible for a "missile gap." Indeed, at that time, the United States had 21 ICBMs in its missile arsenal, to the Soviet Union's 50. In intermediate-range missiles, the ratio was about the same.

However, two years later, the United States had outstripped the U.S.S.R. in ICBMs, and in early 1963 the United States had 450 long-range missiles, to the Soviets' 75. In 1958, Maj. Gen. Bernard A. Schriever wrote that his group, which had been given "the highest national priority" in 1955 to develop a U.S. ICBM, had accomplished "in three-and-a-half years what it took the Soviets seven years to do."

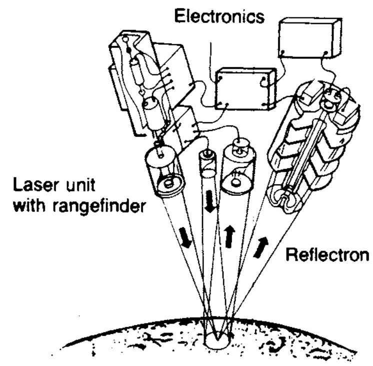
The United States decided before the first American landed on the Moon, to throw away the heavy-lift launch capability Saturn V rocket, as soon as the Apollo program was over. Without a national program to develop directed-energy technologies for strategic defense, or for the ASAT defense of assets in space, no mission was in sight for the military use of heavy boosters.

The civilian NASA programs were stripped to one-third their previous size over the course of the 1970s, and the only NASA vehicle on the horizon was the Space Shuttle. Both NASA and the Defense Department have been in the process of reevaluating this nation's launch requirements over the past few years, and the loss of the *Challenger* accelerated the process. It is now agreed that the United States needs a heavy-lift launch vehicle for SDI-related missions, and future space science and exploration plans.

So far, the Congress has stood in the way of getting development of a new heavy launcher under way. The Defense Department requested that $500 million be added as a supplemental budget increase, to the FY87 (current year) SDI budget, over $100 million of which was to be the start-up funding for a joint DOD-NASA program to develop a heavy-lift launch vehicle. That request was never even taken seriously by the Congress.

FIGURE 4

EXPERIMENT SCHEMATIC



The 1988 Soviet Phobos mission will fire a laser and an electron beam 50 meters above Mars' moon Phobos, to vaporize and measure the chemical composition of the soil. Though these are small laboratory-sized directed energy devices, they are trial-runs for the battle stations the Energia *rocket can now put into Earth orbit.*

On April 22, the Air Force announced that it was seeking industry design concepts for what is now being called an "Advanced Launch System," which it is estimated will cost about $17 billion to develop. The Air Force announced as well that it would be the lead agency for the project, perhaps in a move by the Defense Department to take the booster out of the controversial and publicly visible SDI budget.

The booster is supposed to be able to carry 100,000-150,000 pounds to low Earth orbit, and be available in 1998. They have included the proviso, that some version of this booster should be ready by 1994, for possible use in SDI deployment. Considering the fact that engines, boosters, and other components of the Space Shuttle system could be reconfigured without the orbiter to produce a Shuttle-derived heavy-lift launch vehicle without 10 years of new development, this schedule is excessive.

So far, the House Armed Services Committee April 30 did approve $150 million in FY88 for the Advanced Launch System, but the DOD budget has been slashed by $23 billion by the full House, and even the Senate version includes over $10 billion in cuts.

There has been no sense of national urgency, no national mobilization called, to answer the threat to the West posed by the *Energia* rocket. As James Oberg has stated, for the first time in 25 years, the Soviets have the lead in rocket power. In the classical case of the tortoise and the hare, this lead was obtained while the "dumb bunny" United States was asleep. Stealing superior Western technology also helped the plodding tortoise.