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12 JANUARY 1984

AIR FORCE
FOREIGN
TECHNOLOGY



BULLETIN



**FOREIGN
TECHNOLOGY
DIVISION**



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~~WARNING NOTICE
INTELLIGENCE SOURCES AND METHODS INVOLVED~~

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SUMMARY

(U) (S) The Soviets have launched three man-related spacecraft in the Cosmos 929 series, and have announced that these spacecraft are multipurpose vehicles with roles such as space station resupply, materials processing laboratory, space station module, and tug for maneuvering their space station. Indications exist that a variant of this vehicle is designed to perform a manned reconnaissance/surveillance mission with other military-related activities. This variant would fly a higher inclination orbit near 70° as opposed to the Salyut space station's 52° orbit. This would give the Soviets access to virtually the entire Earth's surface of military significance except the polar areas.

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SOVIET COSMOS 929 TYPE SPACECRAFT (U)

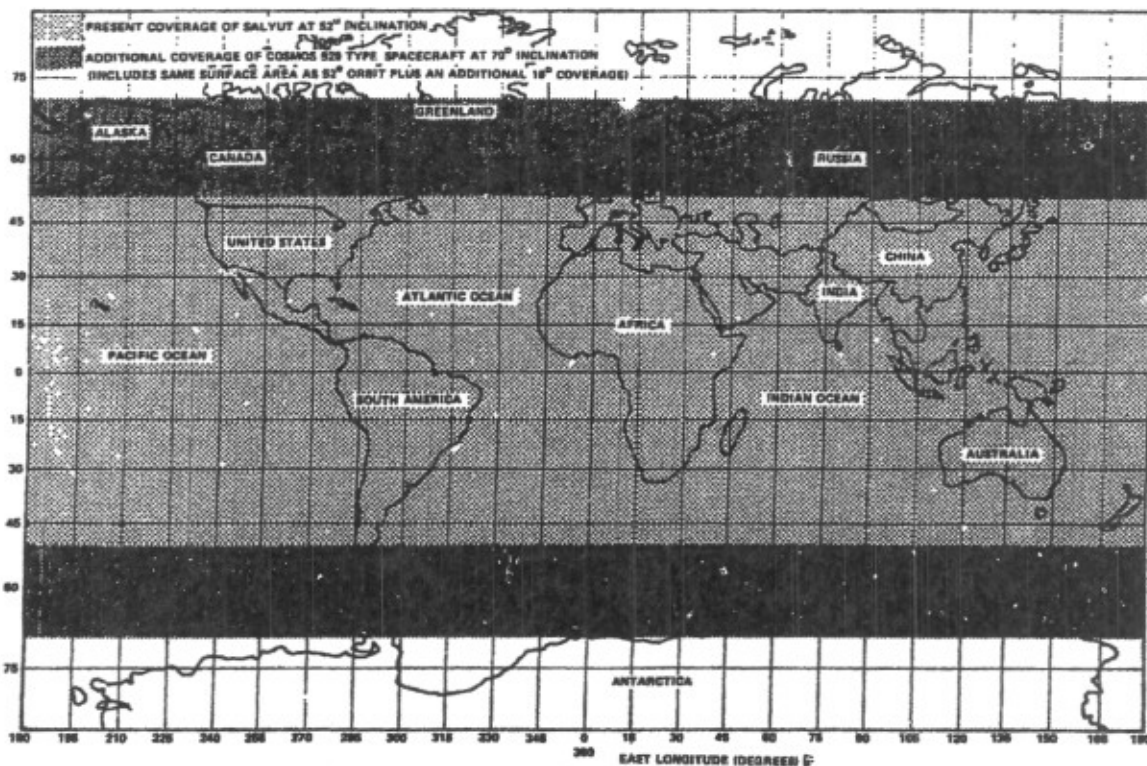
by Mr. David H. Eskins (SDSS) and Lt Elliot B. Kennel (TQTD)

HYPOTHESIS (U)

(U) ~~(S)~~ Since 1977, the Soviets have launched three spacecraft of the Cosmos 929 type. This spacecraft is a 20-ton modular space station vehicle that is comparable in size and weight to the Salyut space station. It consists of two sections, a working compartment and a very dense section that can be returned with up to 500 kg of materials and/or three cosmonauts. It can function as a space station module or as an autonomous spacecraft. The Soviets have announced that the Cosmos 929 type vehicle is a multipurpose vehicle that can perform the roles of space station resupply, space station module, and (in a limited capability) space tug. While the spacecraft can perform all of the above-mentioned roles, it is

strongly believed that a variant will be used as a military reconnaissance/surveillance vehicle, and possibly as a test platform for research and development of space-based weapons.

(U) ~~(S)~~ As a manned reconnaissance/surveillance vehicle, the variant is expected to operate in an approximately 70° orbit rather than the normal 52° inclination earth orbit flown by the Salyut space station. (See Figure 1.) This will increase available earth coverage to all but the polar regions of the world. It will cover the important North Atlantic region to which the Salyut station does not have access at present, including the ocean area as well as northern Europe and Scandinavia. The spacecraft is expected to perform photographic



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Fig. 1 (S) Earth Coverage of Soviet Space Stations

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reconnaissance of land areas as well as ocean surveillance. In operating at these high latitudes a spacecraft will encounter a higher radiation environment that will require extra shielding, which would explain the dense front segment on the Cosmos 929 type vehicles.

(U) ~~(S)~~ The large power supply (3 kW) available, the pointing capability of the spacecraft (0.001°), and the covert nature of the suspected missions, as well as the presence of man aboard, gives the Soviets a suitable platform to do research and development on a variety of projects. These projects could include space-based weapons, imaging synthetic aperture radar, ASW research, or other military activities that would require a more secure platform than Salyut.

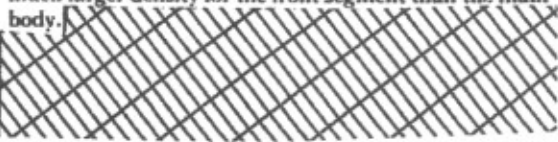
(U) ~~(S)~~ As a resupply vehicle, Cosmos 929 has a cargo capacity of 3 tons, or about twice that of the Progress resupply vehicle. The two orbital main engines have at least twice the thrust of the 6 kN engines on Salyut, and large but undetermined amounts of propellants enable the vehicle to be used as a propulsion module. The onboard computer and life support equipment give the vehicle an autonomous capability that the Soviets say very little about except to mention its possible use as a materials processing laboratory. But the capabilities of the computer as seen so far indicate a vehicle with much more autonomy and capability than is needed for a materials processing module. Additionally, the Soviets have not mentioned the capability for man to occupy the returnable segment, instead mentioning only the capability to return up to 500 kg of cargo in the

segment. 


BACKGROUND (U)

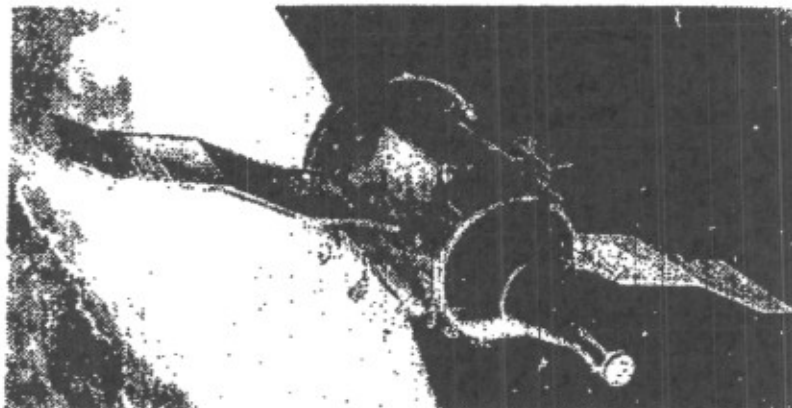
(U) ~~(S NOFORN UNINTEL)~~ Cosmos 929 was launched on 17 July 1977 with the SL-13 launch vehicle. The spacecraft had an estimated mass of about 19,000 kg and consisted of two parts, a cylindrical main body 4 meters in diameter and approximately 6.5 m in length and a conical section about 5 m in length with a large diameter base of about 3 m in diameter that was deorbited and recovered after 30 days in orbit. (See Figure 2.) The density was different for the two parts. The main compartment was estimated to weigh 12,500 kg and the recoverable segment 6,500 kg, revealing a much larger density for the front segment than the main body.

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(U) ~~(S)~~ Cosmos 1267, the second of the Cosmos 929 type spacecraft, was launched on 25 April 1981.


The recoverable segment of Cosmos 1267, like Cosmos 929, was separated and returned to the Soviet Union after 30 days in orbit. The remaining cylindrical body segment docked with Salyut 6 approximately one month later.



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Fig. 2 (FOUO) Soviet Artist's Concept of Cosmos 929 Type Vehicle

Then, for a one year period the Soviets performed engineering tests with the unmanned Salyut 6 docked with Cosmos 1267, subsequently deorbiting and destroying the two spacecraft.

(U) In the spring of 1983 the Soviets launched the latest of the Cosmos 929 type vehicles, Cosmos 1443. They eventually docked the vehicle to the Salyut 7 space station and manned the complex in June 1983. During the manning the Soviets released a great deal of information about the vehicle. The vehicle carried about 3 tons of equipment, could operate autonomously, provided 50 m³ additional space, and had a return capsule capable of returning about 500 kg of cargo to Earth.

(U) (S) In addition to the launches of Cosmos 929 type spacecraft, the Soviets also launched a series of three so-called dual-payload vehicles; each launch consisted of two spacecraft on the same launch vehicle. These launches started in 1976 with subsequent launches occurring in 1978 and 1979. The spacecraft were launched in pairs by the SL-13 launch vehicle with the vehicles stacked in tandem. These spacecraft were the same type as the front segment of the Cosmos 929 vehicle, and were probably test vehicles to verify the reentry characteristics of the recoverable segment of Cosmos 929.

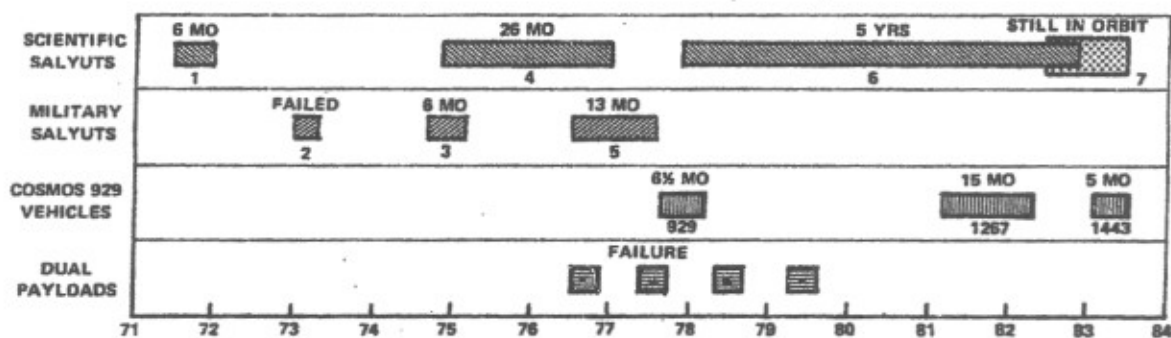
(U) (S) The initial launch of the Cosmos 929 spacecraft came when the Soviets had two space station programs in operation. Salyuts 1, 4, 6, and 7 were scientific research stations, but performed increasingly military-related research with each station. Salyuts 2, 3, and 5 were military research and photoreconnaissance space stations, with photoreconnaissance being the primary mission. However, after the last manning of Salyut 5 in 1977 the Soviets elected not to launch another manned

military space station. (See Figure 3.) Instead, they probably used the scientific space stations Salyut 6 and 7 to perform activities that would normally be associated with a manned military space station. In 1976, the year the last military Salyut was launched, the Soviets launched the first of the dual payload spacecraft. Cosmos 929 was launched in 1977. It appears most of the research and testing for the new manned military space station has been completed with the manning of Cosmos 1443 in 1983.

(U) In 1981 an article in the Soviet publication Atomnaya Energiya addressed the radiation safety standards for manned space flights. Pertinent points in the article were the construction of an orbiting manned space station and the parameters of the orbit. The station was assumed to have an orbital inclination of 70° and a flight altitude of less than 400 km. The article described a space station that had two sections, a working compartment and a radiation shelter.

(U) In the altitude and inclination of manned space stations observed to date typically 325-350 km altitude and 52° inclination, there is little threat of excessive radiation exposure. The platform lies well beneath the Van Allen belts, so there is little exposure to Van Allen radiation. Also, the Van Allen belt acts as an electromagnetic shield against solar proton flares. Typical dose rates for Soviet cosmonauts have been on the order of 10 mrem/day with peak dose rates of 400 mrem/day during solar flare conditions accompanied by disturbances in the earth's magnetic field. (Solar flares occur randomly and cannot be accurately forecast for more than a few days.)

(U) The radiation hazard is worsened considerably if the 52° orbital inclination becomes approximately 70° because the Van Allen belts are closer to the



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Fig. 3 (S) Soviet Space Station Vehicles Launched Since 1970

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Earth's surface near the poles. Solar proton flares become a much more significant hazard since the protons penetrate the Van Allen belts more easily at higher latitudes.

(U) Soviet data published in the open literature clearly indicate that a well shielded compartment is a mandatory requirement for a manned space station in a 70° inclined orbit. The cosmonauts would have to retreat into the sheltered compartment during solar flare activity in order to avoid receiving an unacceptably high radiation dose. The cosmonauts might also sleep in the sheltered compartment to reduce Van Allen radiation exposure. These procedures would be necessary to remain within Soviet radiation safety standards criteria limits.

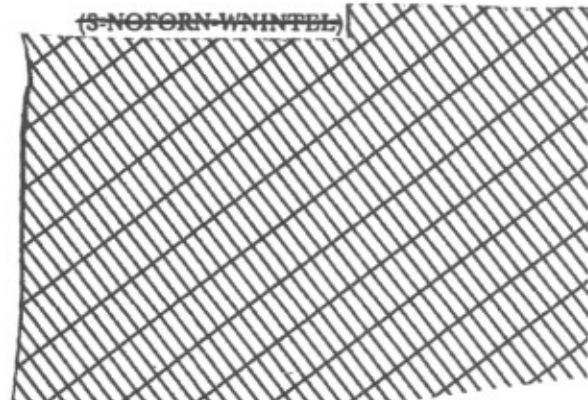
(U) The Soviets have found that the risk criterion can easily be satisfied in the present 52° low earth orbit, but it cannot be satisfied in a 70° inclined orbit unless a sheltered compartment is included.

(U) (S) The reentry vehicles aboard Cosmos 929, 1267, and 1443 are estimated to weigh approximately 6,500 kg, which is about 3,500 kg heavier than would be expected based on past Soviet reentry vehicle characteristics. The reentry vehicle can accommodate up to three cosmonauts, but so far it has not been used for a manned reentry operation.

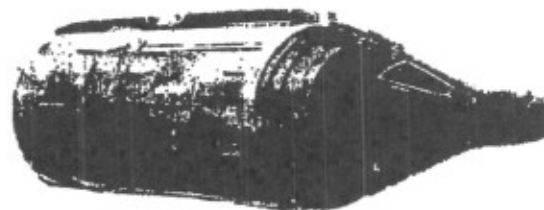
(U) (S) Open literature indicates that the mass thickness (shielding mass divided by the surface area shielded) could range from 143 kg/m² to 220 kg/m² depending on the mission duration and expected solar flare frequency. (Solar flares, though largely random, tend to follow an 11 year cycle.) If it is assumed that the Cosmos 929 reentry vehicle is intended also to serve as a radiation shelter, the additional mass taken up by shielding would be on the order of 3,000 kg, based on a six-month manned operation and approximately 20 m² that needs to be shielded. This corresponds reasonably well with the unaccounted for mass observed on the reentry vehicle for Cosmos 929 type vehicles.

(U) (S) The postulated additional function of the reentry vehicle as a radiation shelter is plausible for two reasons. First, to put the radiation shelter in the working compartment would significantly decrease the work space, and the reentry vehicle would already have redundant life support and communication facilities. Second, the Soviets claim that previous reentry modules, both US and Soviet, are inadequately shielded against radiation hazards associated with flights outside the Van Allen belt, such as flights to the Moon. For example, the Soviets claim that a solar flare similar to that of 4 August 1972 would have radiated an astronaut in an Apollo command module with over 200 rem, resulting in vomiting, hemorrhaging, and other serious

consequences. Thus, radiation safety considerations dictate a significantly heavier reentry vehicle.



(U) (S) The Cosmos 929 type vehicle, as well as the suspected missions of such a vehicle, is very similar to the cancelled US Manned Orbiting Laboratory (MOL) of the mid-to-late 1960's. (See Figure 4.) Even the suspected method of access to the Cosmos 929 returnable segment via an off-center hatch through the heat shield is identical to the method proposed for the MOL vehicle. MOL was an Air Force project planned to use a modified two-man Gemini capsule attached to a laboratory module. It was to be launched by a Titan launch vehicle from Vandenberg Air Force Base. Some of the missions envisioned included reconnaissance and surveillance of both land and ocean areas, satellite inspection, early warning of hostile redeployment in times of crisis, and other military directed tasks.



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Fig. 4 (U) US Manned Orbiting Laboratory (MOL)

CONCLUSIONS (U)

(U) (S) The Soviets are believed to be involved in preparing a manned Cosmos 929-type spacecraft for high inclination orbits. It is expected to perform military operations such as reconnaissance, surveillance, and

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military research and development. The recent Soviet claims and pronouncements that the Cosmos 929 vehicle is designed to operate as a space station resupply vehicle, a tug for the Salyut space station, and a space station module are considered to be true. But, it appears

that the openness by the Soviets concerning this spacecraft may be designed as a smoke screen to conceal an additional military function of the vehicle. They have not mentioned nor acknowledged any potential military role for this space station module.

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