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GUIDED MISSILE AND ASTRONAUTICS INTELLIGENCE COMMITTEE

12 October 1961

MEMORANDUM FOR: Chairman, Scientific Intelligence Committee

SUBJECT : GMAIC Contribution to SIC Estimate on
Soviet Science and Technology

Attached is the GMAIC contribution to the SIC Estimate on Soviet Science and Technology. This contribution based on member agency/service drafts was reviewed and approved by GMAIC on 10 October 1961. Where specific replies to the terms of reference are not included, we suggest liberal use of pertinent portions of NIE's 11-5, 11-8, 11-3 and /or others bearing on this subject.


EARL McFARLAND, JR.
Colonel, USAF
Chairman

INFO GMAIC MEMBERS

Attachment

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(Refer also paragraph 175, NIE 11-5-61)
(Refer also paragraph 20, NIE 11-8-61)

Systems for AttackA. Missiles

The Soviets lead the U. S. in the system development of powerful rocket boosters, insofar as functional applications in space through the use of the boosters are concerned. The estimates of future Soviet rocket capabilities represent the probable extensions in engineering that will be attained. Only limited intelligence is available concerning advanced Soviet applied research that will allow continued growth of Soviet rocketry after the technical growth limits of the present design practices are reached. This is to say that the rocket design concepts now receiving the Soviets attentions do have limits of growth potential, and that intelligence has not yet detected significant research gains associated with more advanced development of rocket technology. There is, however, some evidence of Soviet research directed at more advanced propulsion systems, such as nuclear, ion, or plasma engines. The significance of the Soviet position lies in the fact that new design concepts will require several years of development before they may be incorporated into the operational side of

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rocket technology, but the expected level of associated research and testing has not yet been detected.

Appendix B

1. In the past year, the Soviet space program has been broadened in two important respects. The introduction of manned earth satellite vehicles and the attempted launching of probes to the vicinity of Mars and Venus have been impressive advances in the level of their space flight technology. The program has been characterized by a sequential attack on dramatic space ventures arranged according to their increasing difficulty. Flights have been programmed against a given space objective until it is accomplished and when limited periods are involved, back-up vehicles are always in a ready condition. Intervening flights are few and appear to have been designed to acquire the minimal data required for the major objective ahead. Some were timed to coincide with international political moves. The maximization of these has created in the eyes of large segments of the world's population an image of superiority, not only in space flight technology, but in over-all science and military strength as well. The importance of these objectives to the USSR's over-all aims is most forcefully demonstrated by their allocation of approximately one third of all launching vehicles thus far expended at Tyuratam to the space program.

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2. The USSR's achievements in space to date are consonant with their stated intent to eventually engage in the manned exploration of the solar system. While it is true that the vertical probes, manned and unmanned satellites, and space probes have carried scientific instruments, basically we believe these experiments have not been for the prime purpose of pure science, but rather for application to specific space achievements. Reinforcing our belief that manned space flight systems will play an important role in their future programs, has been their persistent interest in bio-astronautics and life support systems first noted in the vertical probe firings (1949-1960), Sputnik II (1957), Sputnik V (1960), Sputnik VI (1960), Sputniks IX and X (1961), and most recently the two manned orbital flights.

3. Hard evidence supporting an interest in the use of space for military purposes is lacking. Such objectives are believed to be a part of their space program, however. The belief that a military interest exists is gained inferentially, for example, by their expressed willingness to negotiate for the removal of SAC bases from their periphery in exchange for a promise on their part to not engage in the military use of space. Also, the Vostok, first used to orbit man, possesses the essential elements, crude as they may have been, to deliver a strategic weapon. Additionally, many of their space experiments have produced information which would be useful in the development of military space systems for employment in a

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support role. It would be technically feasible now for the USSR to equip earth satellites for such military roles as communications, reconnaissance, navigation or the collection of weather data. The line carried in their propaganda on space, with only a few inconsistencies, has confined their interests to the peaceful exploration or use of space.

4. Characteristics of the Soviet space program are its overall objectivity and apparent simplicity and versatility of the family of rockets thus far used. With the possible exception of the two earliest Sputniks, it is significant that the Soviet ICBM space launching vehicle has used the same booster as the 1st generation ICBM. This rocket is approximately twice the size of Atlas but has more than twice the payload capability. In the entire flight program, only three different upper stages have been used. In the fifteen successful launchings to date, the following five basically different missions have been accomplished using the four (including the ICBM booster) aforementioned propulsion vehicles. Various combinations of these vehicles have been used to achieve: (1) the orbiting of 3000 pounds using only the ICBM booster, (2) lunar missions with up to about 1000 pounds payload using the ICBM plus one stage, (3) the orbiting and recovery of a 10,000 pound manned vehicle using the same lunar propulsion system, (4) the orbiting of 14,000 pounds making use of a new 50,000 lb. upper stage and another stage similar in characteristics to the one used in lunar missions and manned recovery flights and (5) the

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same propulsion vehicles as (4) to launch a 1400 pound vehicle to the vicinity of Venus.

5. In the foreseeable future, a continuation of the basic pattern of simplicity and versatility in the selection of a minimum number of major objectives to be accomplished in any given period is anticipated. More advanced missions will be successively undertaken as technology progresses and will be selected taking strong account of the impact each will have on further enhancing the image of over-all Soviet superiority. Within the confines of already demonstrated capability, the USSR could place two or three men into an earth orbit for several days, could land an instrumental package on the moon or could place a vehicle in orbit around the moon. It could also place useful payloads into highly elliptical orbits around the earth to determine the detailed character of space environment. Employing the booster, based on the 1st generation ICBM with improved upper stages, payloads up to about 20,000 pounds in low altitude earth orbits are possible. Intelligence on a new rocket test facility near Kuybeshv indicates that the Soviets are actively developing a large rocket engine system with thrust in the range of 1,000,000 to 4,000,000 pounds. The evidence at this time, however, does not permit determining whether the engine being developed is a large single engine or a cluster of smaller ones. This test stand has an estimated date of completion of mid 1961. Consequently we estimate that a new, large, single chamber

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motor could be available for flight test in 1963 with clustered versions by 1965 which will permit an order of magnitude increase in payload capability. If this capability does in fact materialize on the time schedule estimated, the Soviets would have a powerful foundation in rocket propulsion strongly supporting the launching of very heavy earth orbiting space platforms with an associated rendezvous capability, and manned lunar missions including landing and return to earth prior to 1970. Although lacking good evidence, it is estimated that the Soviets will develop nuclear and plasma rockets for upper stage use before the end of the decade.

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APPENDIX C - IB, Ia, c.3.

Present and Future Capabilities in Military Research and Development

1. Air Defense Missiles

a. We have seen the rapid Soviet improvement of their medium and high altitude air defense capability from the static, dense, and costly SA-1 complex around Moscow to the mobile SA-2 system which affords medium and high altitude protection to many important cities, industrial complexes, military centers and the Soviet field army. The SA-3 low altitude system is currently believed to be in the process of deployment and it is probable that the SA-2 system is undergoing capability improvements as this is the normal product improvement for any missile system. The Soviets have demonstrated considerable advancement in the past few years in the air defense field and their capability in the associated fields of nuclear physics, computers, and electronics both in manpower and equipment is large and of high calibre.

Future Soviet research in the surface-to-air missile systems will undoubtedly include extensive and exhaustive exploitation of exotic fuels and advanced propulsion systems; more accurate guidance systems with additional resistance to electronic countermeasures (ECM); improved electronic acquisition and fire control systems and techniques; and, both conventional and unconventional warheads utilizing more sophisticated fuzing systems. Evidence indicates that the USSR possesses the scientific

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knowledge and technical skills to develop complex and elaborate systems for advanced air defense capability during the next 10 years.

c. AMM

The Soviets have recognized that the defense problem of the 1960 decade is defense against ballistic targets. According to Premier Khrushchev, the Soviets began developing defenses against ICBM's at the same time they started developing ICBM's. From the available evidence they are continuously and systematically developing defenses against ICBMs, IRBMs, and shorter range ballistic missiles. Present developments at Kapustin Yar, Sary Shagan, and on Kamchatka Peninsula suggest that more than one separate antimissile missile defense systems are under study.

3. Space Defense

a. The Antisatellite Mission

The view that U.S. ESV's pose a threat to the USSR is evidenced by their continuing propaganda to the effect that all U.S. space programs are military. Since it is obvious that they would like to prevent any satellite coverage of the USSR, it can be assumed that they are concerned with developing some means for destroying such vehicles.

The general antisatellite mission is simply defined as the prevention of any military or ideological mission by the enemy through the utilization of satellites. The accomplishment of the mission may require physical destruction of some satellites, although certain vehicles may be

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neutralized by other means.

During the time period under consideration (1961-66) U.S. satellites will pose only an indirect military threat to the USSR. Most will be programmed to orbit below 1,000 nautical miles since earth surveillance missions are more easily performed at lower altitudes. For this reason, and since the U.S. ballistic missile threat in this time period will be a very real one, the Soviets may feel that their AMM effort should not be diluted by the concurrent development of an anti-satellite system. The Soviets do, however, have the option of designing their AICBM system so as to maximize its anti-satellite capabilities.

b. Initial Antisatellite System

If the Soviets chose to use nuclear or even non-nuclear warheads of large enough size, the SS-3, 4, or 5 could be utilized to interfere with hostile ESV's. We wouldn't expect this to be used except on a "one time basis". It is estimated that the Soviets will try to achieve a limited antisatellite capability with the components of the AICBM system. This antimissile system equipment is specifically designed for split second timing and the antimissile missile would have a good likelihood of damaging a satellite either with conventional or nonconventional warheads. If this missile is employed with its 350 kiloton warhead it could

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intercept satellites at 200 n. m. altitude, doing severe damage to a radius of 15 n. m. and lesser damage to a radius of 100 n. m. With a lighter 25 kiloton warhead, this missile could intercept satellites up to 300 n. m. Such a limited capability could be achieved in a few months, provided the task was given top priority, utilizing existing hardware from research and development sites at Sary Shagan and Uka. Operations would be limited to the intercept of low orbit satellites sometime after the vehicles first orbit of the earth.

c. Defensive satellites

The space technology is available and the Soviet government can apply it to either defensive or offensive systems.

If the Soviets decide to build a defensive satellite, this vehicle will probably have a dual mission. It will assess the threat which a U.S. satellite represents by effecting a co-orbital interrogation. Then, if the assessment warrants immediate neutralization the inspector-interrogator satellite will take appropriate measures (kill, jam, deflect from orbit, or otherwise neutralize).

The Soviets can conceivably develop an unmanned inspector interrogator, satellite by 1963-65 and a manned type after 1965.

The components of equipment at Sary Shagan and Uka may have the capabilities today which could be employed in the launching and initial control of such defensive satellites. The type of defensive satellite

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being estimated has its complexity in the space vehicle itself not in the launch and initial control facilities. The basic capability of the USSR to put large payloads into orbit gives them a head start toward developing defensive satellites. With a large payload, the defensive satellite can be less complex.

No evidence has yet been uncovered which indicates that the USSR is actually developing a space based defensive system.

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