

THE KREMLIN
AND THE COSMOS



THE KREMLIN AND THE COSMOS

by NICHOLAS DANILOFF

ALFRED A. KNOPF, New York, 1972



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Alfred A. Knopf, Inc., New York, and simultaneously
in Canada by Random House of Canada Limited, Toronto.**

Distributed by Random House, Inc., New York.

ISBN: 0-394-47493-7

**Library of Congress Catalog Card Number: 79-171136
Manufactured in the United States of America.**

FIRST EDITION

*To the memory of those brave men—
Soviet and American—who gave their
lives in the conquest of space*

acknowledgments

This book is a view, by an interested outsider, of Soviet space efforts in the long perspective of history. Undoubtedly it must have its shortcomings, particularly where there continues to be a lack of adequate, open Soviet documentation.

A problem in writing a book such as this is the overabundance of information on some subjects and the paucity of material on others. It may be felt that writing a book on Soviet space efforts from the distance of Washington was foolhardy. But an enormous amount of Soviet material is readily available here in the daily press, specialized journals, transcripts of endless radio broadcasts, popular and scientific volumes. The incomparable resources of the Library of Congress (where much of the research for this book was done) are most usefully supplemented by the files, archives, and libraries of the Department of State, the National Aeronautics and Space Administration, and the Smithsonian Institution and its National Air and Space Museum. In addition, there are a number of individuals in the Washington area who have made a serious hobby of watching Soviet

space experiments and who have willingly cooperated with my own efforts.

A brief word about Russian names and titles: In rendering Russian names into the Roman alphabet I have not employed any of the various academic or library systems of transliteration. Rather, I have tried to give them in as simple a form as possible. Where Russian names are quite familiar in the West I have adopted these usual forms. In the bibliography I have translated the Russian titles directly into English rather than give the full Russian versions, which would be difficult for the general reader to understand.

I would like to thank all those who have helped me during the last several years; they include numerous U.S. officials as well as representatives of the Novosti Press Agency of the Soviet Union. Naturally, I have taken full responsibility for all I have written and for the errors I may have unwittingly made. I would particularly like to thank Dr. Charles S. Sheldon II, chief of the Science Policy Research Division of the Library of Congress; Frederick C. Durant III, Assistant Director for Astronautics of the National Air and Space Museum; Dr. Eugene M. Emme, Historian of the National Aeronautics and Space Administration; Kenneth A. Kerst, deputy director of the Office of Research and Analysis for the U.S.S.R. at the State Department; and Konstantin L. Zakharchenko, a former consultant at the Library of Congress, who brought to my attention valuable pieces of open and unclassified information about Soviet activities.

Joseph L. Myler, science reporter, and Stewart M. Hensley, diplomatic correspondent of United Press International, also aided by supplying books, magazines, and helpful advice.

Roderick MacLeish, senior commentator of the Westinghouse Broadcasting Company, was an endless source of encouragement during those dark days which most authors experience when they would rather give up than continue. In a very real sense this volume owes its life to Roderick MacLeish, who saved it more than once.

Mrs. Anna Farrell of Arlington, Virginia, typed the manuscript with admirable patience and perseverance.

Finally, I would like to thank Ashbel Green, managing editor of Alfred A. Knopf, Inc., for his interest and encouragement of this project when it was still a collection of disjointed pages.

Nicholas Daniloff

Washington, D.C.
summer 1971

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Konstantin Tsiolkovsky, Russian theorist of space flight, in 1934.

Friderikh Tsander, Soviet rocket pioneer, in 1913.

The Soviet rocket that launched the first sputniks.

Valentin Glushko, an early Soviet rocket pioneer.

A giant rocket on display in Moscow's 1965 Victory Day parade.

Yuri Gagarin, first spaceman, and Chief Designer Sergei Korolyov.

The augmented Vostok rocket, used to put the latest Soyuz spaceships into orbit.

Premier Nikita Khrushchev speaks to cosmonaut Valery Bykovsky in orbit, 1963.

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AND THE COSMOS



prologue:

OCTOBER 4, 1957

In the early hours of Saturday, October 5, 1957, an employee of the Soviet news agency TASS bent over a teletype and flicked a switch. From the TASS headquarters on the edge of tree-lined Tverskoi Boulevard, a message began to clatter out to the world:

For several years research and experimental design work has been underway in the Soviet Union to create artificial satellites of the earth. It has already been reported in the press that the launching of the earth satellites in the U.S.S.R. was planned in accordance with the International Geophysical Year.

As a result of the intensive work by research institutes and designing bureaus, the first satellite was successfully launched in the U.S.S.R. October 4 . . .

In London, because of a three-hour time difference, it was still only Friday night, October 4, and a few minutes before midnight. The international news services, Associated Press, United Press, Reuters, and Agence France Presse, were completing their reports for morning newspapers and broadcasting clients. It had been a particularly quiet night, according to Henry W. Thornberry, the late-night editor for United Press. Early editions of the London morning newspapers contained no major items; there were no impending problems and Thornberry was ready to go home. He had put on his overcoat and sat at the news desk while waiting for the relief editor who would be a few minutes late coming on.

"I could have left the news desk and sat down at the other end of the office," Thornberry recalled years later, "but for some reason I sat at the desk, just doodling aimlessly, on the paper roll of one of the teletype machines. You know which machine it was? The TASS printer. Suddenly, its keys came alive. It didn't take more than a few seconds to realize the significance of what was happening. The Russians had launched the first artificial satellite in the world! Automatically, I began sending off hurried bulletins to New York. I didn't get a chance to take my coat off for two hours, and it wasn't until six o'clock in the morning that I left the office."¹

In Washington, scientists and newspapermen were gathering in the ornate, gilded ballroom of the Soviet Embassy at 1125 Sixteenth Street, N.W. The occasion was an evening reception offered by the Soviet delegation to a conference on coordinating rocket probes and satellite launches during the International Geophysical Year. The conference was nearly over—it was sched-

uled to end on Saturday, October 5—and *New York Times* science correspondent Walter Sullivan thought he was onto a major story: in an effort to take continuous geophysical soundings at extremely high altitudes, the United States and the Soviet Union had announced in 1955 that they would orbit the world's first artificial satellites during the year of international scientific cooperation; now, Sullivan believed, the Russians were on the verge of a launching—well ahead of the United States. The story, he thought, was so sensational that he had delayed writing for several days in order to get further confirmation. But at last he had satisfied himself, and submitted it to his office before leaving for the reception at the embassy.

“It was a story that never got published,” Sullivan remembers. “I arrived at the Embassy only to be summoned to the telephone by a Soviet official. It was my newspaper calling to tell me of the successful launching of Sputnik and letting me know my story was already out of date. I told several acquaintances and we decided to inform Lloyd Berkner, the coordinator for rockets and satellites under the International Geophysical Year. Berkner clapped his hands to get the attention of the guests and announced: ‘I am informed by *The New York Times* that a satellite is in orbit at an elevation of 900 kilometers. I wish to congratulate our Soviet colleagues on their achievement.’

“The Russians,” Sullivan told me more than a decade later, “appeared not to have been informed of the event yet. Quite possibly their communications were slower than the news service reports from Moscow.”²

This, roughly, was the manner in which the news of

appendix a

*Interview by the Author with
Proj. Dr. G. A. Tokaty-Tokaev at the City University,
St. John Street, London, E.C.1, July 17, 1968*

Question: You have described in your writings meetings with Soviet leaders during which you advised on the possibilities of developing long-range rockets. Can you say for what purpose the Soviet leaders were interested in these weapons?

Answer: Which meetings were you referring to? There were several.

Question: I have knowledge only of the meetings which you referred to in your book *Stalin Means War* and in the account that is included in Eugene Emme's *History of Rocket Technology*. By the way, in these accounts the dates differ. In the former you date the meetings in April 1947, and in the latter in March 1947. Which dates are correct?

Answer: The account appeared also in my books *Comrade X* and *Soviet Imperialism*, and in very many articles. However, the dates in question have become mixed up and the error has tended to perpetuate itself. The correct dates are, of course, 14th to 16th April, 1947. I am grateful to you for bringing the matter to my attention: I shall correct the error in future publications.

Question: To return to the aims of the Soviet leaders at the meetings in April 1947 . . .

Answer: Yes, the purpose of the meetings: A good archer is known not by his arrows but by his aim. You see, the U.S.S.R. claims to be a Communist country; and the long-term aim of Communism is the replacement of the capitalist system by the system of Communism. Now, Marx, Lenin, Trotsky and Stalin

taught that this aim can only be achieved by means of a socio-political and economic revolution. But such a revolution requires modern armaments. Moreover, the theoretical [sic] aim of Hitler's war against the U.S.S.R. was the destruction of the achievements of the October Revolution and, consequently, the prevention of such revolutions elsewhere. But the Soviet Union came out of World War II as a leading military power, determined to stand up to any new anti-Communist war, to the whole non-Communist world. Above all, this meant standing up to the United States, which by then possessed the B-29 bomber, the A-Bomb, many German V2s, and the leading rocket designers of Germany. The Soviet leaders knew that, until and unless they did something along these lines, they could not stand up to the U.S.A.

To the Russians there was nothing new in rocketry, in general and in a theoretical sense. But during the war the U.S.S.R. had not produced anything like the V2 rocket; therefore the Kremlin leaders were very much worried. . . . In rocketry proper, too, there had been good progress in the Soviet Union. But then there was war. In the beginning our armed forces were smashed. The western part of the country was smashed. We had to dismantle everything and move back to a safe area. We lost every normal condition of work. The war abruptly distorted our work. The U.S.S.R. was losing everything, and the Germans were gaining; the Germans were gaining a great deal from other Europeans. We could do little until the end of the war. We had to move back and then start again at square one. In the end, however, we learned a great deal from the Germans, other European countries, from British and American experience. We were anxious to learn from everyone—which helped.

By the end of World War II, the Soviet Union and the United States constituted two profoundly different worlds. They had to stand up, face to face, as two opposing worlds. Now, remember that the U.S.A. had the long-range B-29 bomber and the A-Bomb: we could be reached by them. But we had neither a bomber capable of reaching the U.S.A. nor the A-Bomb. From a purely military point of view, the situation was really desperate, and hence the line of thought of the Kremlin leaders. There was only one way out: to solve the problems of long-range bombers, rockets and A- and H-Bombs.

This was a direct confrontation of the old enemies—of Communism and capitalism. America was the determined leader of the

second, and the Soviet Union the determined leader of the first. The so-called “proletarian internationalism” made the U.S.S.R. responsible for communism at large; not just for the U.S.S.R. itself, but throughout the world. For all theoretical and propaganda purposes, this was a great responsibility before the history of Communism. In reality, however, it was a responsibility before the age-long tradition of Russian expansionism. But whatever it was, it required—or demanded—the urgent creation of appropriate material means. What were these means? Well, we began working on an aircraft similar to the B-29. Then, already in 1944, Soviet scientists knew of the V2 and the Sanger project. And it was natural for scientific advisers to call the attention of the leaders to these projects: governments do not make decisions without consultations with advisers.

Question: It has sometimes been suggested in the West that the Soviet Union was interested in its propaganda position while pushing ahead with its space program. Was this question of propaganda image raised in April 1947, at the discussions which you attended?

Answer: No, I do not remember specifically propaganda statements at these meetings. I thought Stalin and his colleagues meant business. But, then, of course, every stick in the world has two ends; a rocket—Soviet or American—is both an effective monster and a propaganda weapon. I also agree that the Soviets love propaganda. But it would be a dangerous illusion to think that Gagarin, Titov, Bykovsky, Nikolayev, Tereshkova, Popovich, Komarov, Belyaev, Feoktistov and Yegorov were nothing more than propaganda. Facts are stubborn things that do not cease to exist because they are painted this or that color.

Having said this, I should now like to focus your attention on something else. You see, the peculiarity of space technology in the U.S.S.R. is that things are designed to fulfill two or more simultaneous functions. Sputnik-1 was a scientific achievement, a heraldic symbol over the gateway into the unknown, a challenge-warning to the capitalist West, an outstanding propaganda drum, etc. And the designers were aware of all these functions. Similarly, the emergence of the purely strategic ICBM was something like a proclamation of the beginning of space exploration, of man's flight around the moon and beyond, of Sputnik, etc. In other words, there are no rockets, spaceships and space pilots devoid of propaganda value, and there has never been a propa-

ganda launching devoid of scientific-technological importance; therefore, he who talks of rockets and sputniks in terms of only propaganda should have his mind examined.

Question: Exactly when was the decision taken to proceed with an ICBM?

Answer: The initial decision was made at the meetings to which we were referring.

Question: In the prewar years, there existed in the Soviet Union several organizations which were concerned with rocket development. I am thinking of GIRD and GDL. These were unified, if I am not mistaken, in 1933 in a national research institute, the so-called RNII. What has happened to these organizations? What has happened, for example, to GDL and to RNII?

Answer: First of all, let me correct you: RNII is not called "national institute." Its exact name is Reaktivnyi Nauchno-Issledovatel'skii Institut, which translates into "Reactive Scientific Research Institute." RNII continues to exist, in a greatly enlarged and sophisticated form; and GDL remains a laboratory in it. It is no longer accurate to say, however, that the RNII-GDL complex is the only research establishment dealing with rocketry: no, far from it!

Question: You are in a good position to compare the Soviet and American space efforts. How would you compare them?

Answer: Both programs do exceptionally well. The Americans openly advertise all their efforts—the Soviets openly keep their efforts in secrecy. The Americans try to solve far too many problems—the Soviets make drastic efforts to concentrate on a limited number of goals. The American space program is scattered all over the country; therefore it gives rise to many duplications—the Soviet program tries to keep to the diametrically opposite side of organization.

Question: Is the Soviet space program under the control of the military?

Answer: There is a certain correlation of military and nonmilitary. But this exists also in the United States. Take the Thor rocket—this was used in your country, both as a military weapon and as a space booster. Both you and I can be absolutely sure that THERE ARE NO ROCKETS AND SPACESHIPS IN THE WORLD OF NO OFFENSIVE/DEFENSIVE VALUE; therefore the military of every

country is interested in its space programs. I hope this answers the question at least in general terms.

Question: You have written that on April 15, 1947, the Soviet government established a commission to pursue the development of long-range rockets (Pravitelstvennaya Kommissiya po Raketam Dalnego Deistviya). I believe you were a member of this commission. Was it ever acknowledged in the Soviet press?

Answer: No, of course not. No government in the world would publish decisions of this strategic magnitude. Nor were commissions on the development of atomic weapons, tanks, etc., ever publicized.

Question: Can you elaborate on the relations of the scientists and the military?

Answer: Well, let us take GOSPLAN. It is the central planning organ in the Soviet Union. No rocket, aircraft, tank or anything else can be put into production independently or outside the state plans of the GOSPLAN. It works in close cooperation with the Soviet General Staff, therefore there is no duplication of effort. There is a section of the Soviet General Staff which works out in detail military production plans for GOSPLAN.

Question: How did the decision to push ahead with rocketry in 1947 fit into the development of the 1946–50 Five-Year Plan?

Answer: The general goal of this part of the plan was the solution of the problem of rocket launchers by 1950. Then a specialized committee elaborated more precise goals. For example, the improved version of the V2, which was designated the R-14, was planned to reach a serial production stage in the 1947–8 period; therefore, the formation of professional rocket units could be planned for 1950–1.

Question: Did you know Korolyov?

Answer: Yes, I knew him very well.

Question: What did Korolyov do during the war?

Answer: He was continuously working on rockets.

Question: Did he work on rocket engines?

Answer: No, not on engines—not personally. But as a vehicle designer, and as the head of RNII, he influenced the work of rocket engine designers. He worked in the Ministry of Armaments system, while I worked in the Soviet Air Forces system: civilian and military, you might say.

Question: Who is G. V. Petrovich, who writes occasionally—I am thinking of his articles in the *Vestnik* of the Academy of Sciences? Is this name, possibly, a pseudonym for Valentin P. Glushko, another important rocketeer?

Answer: Petrovich? A pseudonym? No, Petrovich is his real name. He works in the GDL in Leningrad.

Question: And Glushko?

Answer: He is working on rocket engines.

Question: How about L. S. Dushkin? What has he worked on?

Answer: Dushkin worked on jet engines as opposed to rocket engines.

Question: What was the purpose of the establishment of the Interdepartmental Commission on Interplanetary Communications of the Academy of Sciences in the fall of 1954, and how did it fit into the organization of the space program?

Answer: The Interdepartmental Commission was established before 1954—I think in 1951—but was announced later. Its task was, and still is, to deal with the problems of general coordination and communication with the outside world. Indeed, someone had to speak for the Soviet Union. The problem arose, in particular, in formulating the Soviet position in connection with the International Geophysical Year. But you could not send Korolyov to meetings of the IGY, for example—you had to send someone like academician Blagonravov.

Question: Blagonravov was President of the Academy of Artillery Sciences, which was formed in 1946. Did the academy play an important role in developing rocketry?

Answer: Lieutenant General of Artillery Anatoly Arkadevich Blagonravov, now seventy-four years of age, is a well-known artillery scientist—in ballistics and artillery armaments. For a very long time, he worked in the “Artillery Academy Named After Dzerzhinsky,” which was reorganized, after the war, into “Military Engineering Academy Named After Dzerzhinsky.” The essence of this reorganization was that it became mainly an academy of rocketry. The reasons: (1) during the 1941–5 war the famous “Katyusha” rockets earned an outstanding reputation; (2) our own and foreign research and development work made it clear that the emergence of medium- and long-range rockets was inevitable; and (3) already by 1947 the U.S.S.R.

was working on the theory and organization of specialized rocket divisions in the Soviet armed forces.

These trends and developments required two kinds of institution: (1) a higher military educational establishment for the preparation of rocket engineers and commanders—the Dzerzhinsky Academy; (2) a central research establishment capable of dealing with the fundamental problems of rocketry and artillery—this task was given to the Academy of Artillery Sciences, which became in due course an Academy of Rocket and Artillery Sciences, headed by Blagonravov.

Question: Did you know Blagonravov?

Answer: Yes, I did. After all, I worked in the Zhukovsky Academy of Aeronautics and he in the Dzerzhinsky Artillery Academy—the two academies cooperated in many fields. Later on, he worked in the Academy of Rocket and Artillery Sciences—and I worked in the field of long-range rockets. I knew a good deal about him, he was one of my early teachers—although not directly, not physically—and I had a high regard for him. I wish him well.

Question: The Soviets are very careful about what they say on their space program?

Answer: They are, indeed. And why should they be careless?! All their statements on research and development are usually approved before they are made. Any paper that is to be presented abroad is approved in advance. Some subjects are simply not discussed at all. For example, the identity of the Chief Designer was never mentioned in the Soviet press. Korolyov's role as Chief Designer was disclosed first by me, in 1960, and acknowledged by the U.S.S.R. itself only after his death.

Question: Would you comment on the timing of the launch of the Soviet Union's sputnik in 1957? Was it intended, do you think, to coincide with the meeting of the IGY preparatory committee in Washington, which was coordinating rocket and satellite research during the IGY? Had it been intended to launch it for the birthday of Tsiolkovsky on September 17?

Answer: The timing of the sputnik launch was too big a piece of cake to play games with. It was launched when it was ready. The Soviet Union tested an ICBM on August 17, 1957, and was ready to fire a sputnik in August. No. Probably not in August. But in September. There was no hurry; it was necessary to check

and recheck to make sure that everything was O.K. What really was important was not the dates you mentioned, but November 7, the fortieth anniversary of the 1917 revolution. You will notice that the Soviets did not launch a new Gagarin or anything particularly sensational in 1967, the fiftieth anniversary of the October Revolution: simply because they were not ready. Of course, they achieved an automated space link-up of two satellites, but your question implies, I suppose, that they should have launched something far more impressive. No, no, the Soviets are very careful, very systematic, and would not play with their space reputation.

Question: Alexander Nesmeyanov, the President of the Academy of Sciences of the U.S.S.R., said, I believe, on June 10, 1957, that the Soviet Union had solved the problem of orbiting a satellite. What did he mean by that?

Answer: Yes, I know about that statement by Nesmeyanov. It was made by him on the advice of the Soviet government, and meant precisely what it said. Let me add that at a symposium held at the College of Aeronautics, Cranfield, England, from July 18 to 20, 1957, Professor Boris N. Petrov of the Academy of Sciences of the U.S.S.R. announced quite categorically that A MAN-MADE SATELLITE WOULD BE LAUNCHED IN 1957. May I say that I, for one, "accepted" these statements at once, for good reasons. For, indeed, by 1957, the U.S.S.R. had launched so many rockets that its ability to put a sputnik into orbit was already beyond doubt. The Soviet scientists knew that if a body were launched high enough, at a certain speed, it would stay up there. They also carried out relevant ground simulation experiments.

So, Nesmeyanov's statement meant that they were ready to proceed to practical deeds. They were checking and rechecking the means and techniques. Everything in the U.S.S.R. is studied first theoretically, then experimentally, then produced: all these stages had been completed. The only remaining question was: When?

Question: What effect, would you say, would the death of Vladimir Komarov, the Soviet cosmonaut who died in the descent of his Soyuz spacecraft, have had on the Soviet space program?

Answer: Basically, none. I mean to say that the fundamental goals remain unaffected. But, as you know, there were no

manned launchings after Komarov's tragedy. This means that the U.S.S.R. decided not to take further risks. The careful study of all the available materials, including *Aviatsia i Kosmonavtika*, hints that there was a thorough investigation of the technical reasons for Komarov's death, and that they have now been established. One can assume that the main cause of the Soyuz disaster was aerodynamic—which means that the aerodynamic aspects of the vehicle had to be re-examined. In my judgment, the problem has now been solved and an improved version of the Soyuz vehicle will soon resume the flights.

Question: When did these hints appear?

Answer: In this year's issues of *Aviatsia i Kosmonavtika*, for example.

Question: I am grateful for your giving me so much time, but I wonder if I could conclude with a few last questions. You would say, then, that the Russian prewar experience with rocketry constituted a great advantage?

Answer: I would say that the prewar rocketry experience was of unquestionable advantage. It permitted the Soviets to continue along a well-matured general line of development.

Question: I have the impression that the American space program, when compared with the Russians', has the appearance of being more hastily put together and is cramped by the matter of a deadline for landing a man on the moon. Would you comment on this point?

Answer: As I have already said, the Americans do very well. Have you ever been, for example, to the North American Rockwell Corporation—Space Division—in Downey, California? What a wonderful organization it is, I must say. Let me tell you that I have many space acquaintances in America, and wish them well. But I also suspect that President Kennedy was not happy with the rigid formulation that a man should be landed on the moon by the end of the present decade. There was no need to formulate the goal in this way. Moreover, I am a bit surprised that the current president has not been advised to issue an official reformulation of the goal. He could say, you know, that the original deadline is not rigid, but that the effort is going to continue; that the attempt would be made in the next two or three years.

But then, of course, landing a man on the moon is only one of

the aspects of the American space program. Let us never forget about the numerous satellites, for example. And in all these fields you, the Americans, do well. I am sure that your Apollo program will reach its goals. But this *could* be achieved without costly duplications. It seems to me that your space effort needs a drastic rationalization. Then there is the problem of the press: it intrudes itself and brings the issue before the public. In the Soviet Union, the situation is different. The decision is made and you get on with the work. It is not written about constantly in the press, it goes ahead secretly.

Question: I assume that when you left the Soviet Union and came to Britain in 1948 you passed on details of Soviet progress to the appropriate authorities. Why, then, was the West so slow to take up the challenge?

Answer: I did not pass on what were regarded, by the Soviets, as secrets. General discussions, yes, but not details. Let me also correct you: I would not say the West was slow. I would say that it was slower than the Soviet Union, but not slow. There were problems in the United States. There was, for example, competition between private companies. Have you seen how keen and how bitter is the competition between firms and corporations? Then there was competition between the branches of the military services. All these complicated the issues.

Question: You mean interservice rivalry?

Answer: Well, I say competition. It is more polite.

Question: In closing, may I ask you about your name? I see some references to "Tokaev" and some to "Tokaty." Which is correct?

Answer: Both are correct. I was born in the north Caucasus and my Caucasian name by birth is "Tokaty." But the Russian version of that name is "Tokaev." The press usually prefers "Tokaev," and I do not mind. As a scientist and educator, I am more known, however, as "Tokaty," and would like to continue under that name. By the way, in many publications I am referred to as "Tokaty-Tokaev," which is also accurate. You can thus choose the name which appeals to you more, and enjoy the game.

Question: Professor Tokaty-Tokaev, I am very grateful for the time you have given me. Thank you very much.

appendix b

*Letter of President John F. Kennedy
to Premier Nikita Khrushchev, March 7, 1962*

Dear Mr. Chairman:

On February twenty-second last I wrote you that I was instructing appropriate officers of this Government to prepare concrete proposals for immediate prospects of common action in the exploration of space. I now present such proposals to you.

The exploration of space is a broad and varied activity and the possibilities for cooperation are many. In suggesting the possible first steps which are set out below, I do not intend to limit our mutual consideration of desirable cooperative activities. On the contrary, I will welcome your concrete suggestions along these or other lines.

1. Perhaps we could render no greater service to mankind through our space programs than by the joint establishment of an early operational weather satellite system. Such a system would be designed to provide global weather data for prompt use by any nation. To initiate this service I propose that the United States and the Soviet Union each launch a satellite to photograph cloud cover and provide other agreed meteorological services to all nations. The two satellites would be placed in near-polar orbits in planes approximately perpendicular to each other, thus providing regular coverage of all areas. This immensely valuable data would then be disseminated through normal international meteorological channels and would make a significant contribution to the research and service programs now under study by the World Meteorological Organization in response to Resolution 1721 (XVI) adopted by the United Nations General Assembly on December 20, 1961.