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Surveys of Soviet Scientific and Technical Literature

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SOVIET LAUNCH-VEHICLE TESTS IN THE PACIFIC OCEAN

Comprehensive Report

W. Hrubiak

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SOVIET LAUNCH-VEHICLE TESTS IN THE PACIFIC OCEAN

Comprehensive Report

ATD Work Assignment No. 57
(Report No. 7 in this series)

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FOREWORD

This comprehensive report is based on Soviet open literature published in connection with the Soviet launch-vehicle tests carried out in the Pacific Ocean from January 1960 through January 1965. Two West German sources have been utilized due to their applicability. Direct quotations from Soviet sources have been literally translated in order to facilitate the comparative analysis of official announcements. This analysis is based primarily on the presupposition that there is some significance in the fact that different expressions have been used to describe various tests. The report consists of three sections: A) Summary and Analyst's Discussion; B) Analysis of the Scope of the Pacific Ocean Tests; and C) Translations of TASS News Releases. Section A contains a summary of these tests in tabular form.

Full translations of some of the source materials used in this report may be available from other agencies or commercially. Interested readers may obtain translation data for individual sources by indicating source numbers from the bibliography list on the form attached at the end of this report and returning it to the Aerospace Technology Division.

TABLE OF CONTENTS

Foreword

Section A. Summary and Analyst's Discussion 1

Section B. Analysis of the Scope of the Pacific Ocean Tests 9

Section C. Translations of TASS News Releases 19

References 34

SECTION A. SUMMARY AND ANALYST'S DISCUSSION

An analysis has been made of materials published in connection with the testing of Soviet launch vehicles in the Pacific Ocean from January 1960 through January 1965. An attempt has been made to include in the reference list for this report all of the open sources on the subject available at the Library of Congress.

The results of a review of materials are shown partly in a table and Mercator projection of the test areas. The table includes announcement dates, test dates, geographical location of each test area, distances between the launch and impact points, if given, and descriptions of rockets launched. Data in the table correspond directly to TASS releases and to the Mercator projection showing the locations and dimensions of the test areas.

The necessary measurements were carried out by Soviet satellite-tracking stations located along the 50th parallel and by special ships stationed south of Midway Island and west of Hawaii. These consisted of freighters equipped with many antennas and many types of electronic instruments. The highly sensitive measuring devices on board are said to have permitted the exact determination of trajectories and flight distances. The 5000-ton vessels "Sutchan" and "Sibir" were the first standard freighters to be converted to rocket-observation ships. These 109-meter ships carried much specialized equipment.

The valuable experience gained with these ships by Soviet rocketry experts has led to the development of a new series of rocket-observation ships, the converted "Chajma" and "Chumican" ships. These ships can be identified by their unusual upper decks. A large balloon-like sphere, mounted on the wheelhouse, provides all-weather protection for the sensitive radar antennas. Additional measuring instruments are mounted on the long foredeck and special antennas are installed aft [1].

According to P. N. Vasilevskiy, Deputy Chief of the Main Administration for Navigation, Ministry of the USSR Merchant Marine, the test areas were selected for the following major reasons: 1) no populated islands in the vicinity; 2) the water is very deep, reaching 5000 meters; 3) the impact area is not in the vicinity of commercial-shipping routes; 4) the area is in the equatorial zone, thus assuring very favorable weather conditions; and 5) moderate winds prevail, the typhoon-breeding area being further to the west [2]. An analysis of materials shows that the launch-vehicle testing program is a part of the overall Soviet space program and is being carried

out by the management system discussed in a previous ATD report [3]. Section B of this report contains materials showing that the launch-vehicle tests in the Pacific Ocean were carried out under the supervision of a person referred to in Soviet sources as the "Chief Designer of Carrier Rockets and Spacecraft [3]."

The table and Mercator-projection chart show that over a period of five years a minimum of 21 launch-vehicle tests were carried out in the Pacific Ocean, and that all of these vehicles were probably launched from the Baykonur Cosmodrome.

Many important questions concerning Soviet testing in the Pacific Ocean remain unanswered in the open literature. According to a TASS communique of 1 August 1964, for example, two areas were designated as reserved for conducting Test Series VII; however, no information is available from the open sources indicating whether these tests were conducted. Series IV was similarly scheduled to take place in two test areas although available material indicates that only one test area was used. It may thus be conjectured that either testing in Area 1 was successful and that there was no need for the series to be continued in Area 2, or that testing in Area 2 was unsuccessful and Soviet officials decided to withhold information on it.

Another question arises due to the fact that for Test Series IV, V, and VI in area 2, between 30° and 40°N and between 170° and 180°E, flight distances were not stated. If the distance was the same as for the areas between 0° and 15°N and 163° and 171°W, then the rockets were not launched from the same launch base area. Conversely, if the launch base area is the same, then the distance must be different. TASS gives no information on this subject. It may be conjectured that the Soviet Union used two groups of impact areas for different types of launch vehicles.

The analyst has divided Soviet Pacific Ocean tests into three basic groups. The first group includes tests conducted between 20 January and 8 July 1960. These tests were directed mainly toward determining the reliability and the accuracy of the guidance system, measuring instruments, and communications equipment. The second group of tests was conducted in 1961 and 1962, during which time a new type of rocket was introduced. No indications have been found which reveal the significance of the phrase "a new type of carrier rocket," first used by TASS in October 1961 (see Series III, test 4 in table). An analysis of materials makes it possible to conjecture that the launch vehicle for the Soviet "global rocket" which was mentioned for the first time by N. S. Khrushchev on 16 March 1962 [4] may have been tested during the 1961—1962 test period.

The phrase "a new type of carrier rocket" has also been used by several Soviet authors to describe the Voskhod-type launch vehicle. If there is some connection between the designation used by TASS news releases and the sources discussing the Voskhod flight, it may be conjectured that the Soviets started testing the original version of the Voskhod-type launch vehicle in October 1961.

The last group of tests starts with Test Series VI, announced on 29 November 1963. In connection with Test Series VI, a new expression "new improved version," appeared. As yet there is no indication concerning its significance. This analyst conjectures that with Test Series VI the Soviets started testing some recoverable and reuseable versions of launch vehicles which will be used to launch heavy spacecraft into Earth orbit, as well as sections of space stations to be assembled in orbit.

As the table shows, the third group of tests includes Series VII and VIII, which TASS has described as being designed to test "a new version of a carrier rocket."

Table 1. Soviet launch-vehicle tests in the Pacific Ocean

Announcement Data			Area Data			Actual Test Data			
Test Series	Date Announced	Planned Test Period	Area No.	Latitude	Longitude	Test No.	Test Data	Distance Traveled (in km)	Brief TASS Description of Carrier Rocket
I	8 Jan 60	15 Jan- 15 Feb 60	1	9 06'N 10 22'N 6 16'N 5 03'N	170 47'W 168 22'W 166 16'W 168 40'W				More powerful rocket
	22 Jan 60		1	Same	Same	1	20 Jan 60	12,500	More powerful ballistic multistage rocket
	2 Feb 60		1	Same	Same	2	31 Jan 60	Unk	More powerful ballistic multistage rocket
II	29 Jun 60	5 Jul - 31 Jul 60	1	7 05'N 7 53'N 5 26'N 4 38'N	169 09'W 167 33'W 166 15'W 167 51'W				New version of powerful multistage carrier rockets
	6 Jul 60		1	Same	Same	1	5 Jul 60	13,000	New version of powerful multistage carrier rockets
	8 Jul 60		1	Same	Same	2	7 Jul 60	13,000	New powerful multistage ballistic rocket

Table 1. Soviet launch-vehicle tests in the Pacific Ocean (Con 'nued)

Announcement Data			Area Data			Actual Test Data			
Test Series	Date Announced	Planned Test Period	Area No.	Latitude	Longitude	Test No.	Test Date	Distance Traveled (in km)	Brief TASS Description of Carrier Rocket
III	11 Sep 61	13 Sep - 15 Oct 61	1	10 20'N 9 10'N 11 30'N 8 05'N	170 30'W 166 45'W 167 55'W 169 20'W				More powerful and improved version of multistage carrier rockets
	16 Sep 61		1	Same	Same	1	13 Sep 61	over 12,000	New more powerful multi-stage carrier rocket
	19 Sep 61		1	Same	Same	2	17 Sep 61	Same	Multistage carrier-rocket
	24 Sep 61		1	Same	Same	3	21 Sep 61	Unk	Carrier rocket
	8 Oct 61		1	Same	Same	4	7 Oct 61	over 12,000	Multistage carrier rocket of a new type
	14 Oct 61		1	Same	Same	5	12 Oct 61	Same	Multistage carrier rocket
	18 Oct 61		1	Same	Same	6	15 Oct 61	Same	Multistage carrier rocket
	24 Oct 61		1	Same	Same	7	22 Oct 61	Same	Multistage carrier rocket
	30 Oct 61		1	Same	Same	8	28 Oct 61	Same	Multistage carrier rocket

Table 1. Soviet launch-vehicle tests in the Pacific Ocean (Continued)

Announcement Data			Area Data			Actual Test Data			
Test Series	Date Announced	Planned Test Period	Area No.	Latitude	Longitude	Test No.	Test Date	Distance Traveled (in km)	Brief TASS Description of Carrier Rocket
IV	16 Oct 62	16 Oct - 30 Nov 62	1	6 52'00"N 5 10'00"N 4 21'30"N 6 07'00"N	165 25'00"W 164 36'30"W 166 16'30"W 167 08'00"W				New version of multistage carrier rocket
			2	36 38'00"N 33 40'00"N 31 28'00"N 34 25'00"N	175 50'00"E 171 10'00"E 173 03'00"E 177 45'00"E				
	18 Oct 62		1	Same	Same	1&2	16 & 17 Oct 62	over 12,000	New version of multistage carrier rocket
	Unk		2			Unk	Unk	Unk	Unk
V	12 May 63	15 May - 15 Jul 63	1	11 41'N 9 03'N 8 03'N 10 41'N	167 49'W 166 34'W 168 45'W 170 00'W				Improved version of carrier rockets
			2	35 23'N 33 10'N 32 08'N 34 21'N	173 52'E 175 24'E 173 56'E 172 23'E				
	29 May 63		1			1&2	18 & 25 May 63	over 12,000	Improved version of carrier rockets
	11 Jul 63		2			Unk	Jun & Jul 63	Unk	Improved version of carrier rockets

Table 1. Soviet launch-vehicle tests in the Pacific Ocean (Continued)

Announcement Data			Area Data			Actual Test Data			
Test Series	Date Announced	Planned Test Period	Area No.	Latitude	Longitude	Test No.	Test Date	Distance Traveled (in km)	Brief TASS Description of Carrier Rocket
VI	29 Nov 63	2 Dec 63-25 Jan 64	1	10 25'N	170 31'W				New improved version of carrier rockets
				11 42'N	167 52'W				
				9 14'N	166 42'W				
				8 00'N	169 21'W				
			2	35 20'N	173 40'E				
				33 02'N	175 40'E				
				32 02'N	173 52'E				
				34 20'N	171 52'E				
	24 Jan 64		1&2	Same	Same	1&2	Unk	Unk	New improved version of carrier rockets
VII	1 Aug 64	4 Aug - 1 Nov 64	1	0 37'N	165 40'W				New version of carrier rockets
		1 Oct 64 30 Dec 64	2	7 15'N	172 35'W				New version of carrier rockets
	Unk					Unk	Unk	Unk	Unk
VIII	10 Jan 65	11 Jan - 1 Mar 65	1	1 35'N	164 01'W				New version of carrier rockets
	3 Feb 65		1	Same	Same	1	30 Jan 65	over 13,000	New version of carrier rocket

Projection is based on the table showing Soviet launch-vehicle tests in the Pacific Ocean (see table for exact coordinates).
Roman numerals refer to test series.
Arabic numerals refer to area numbers.

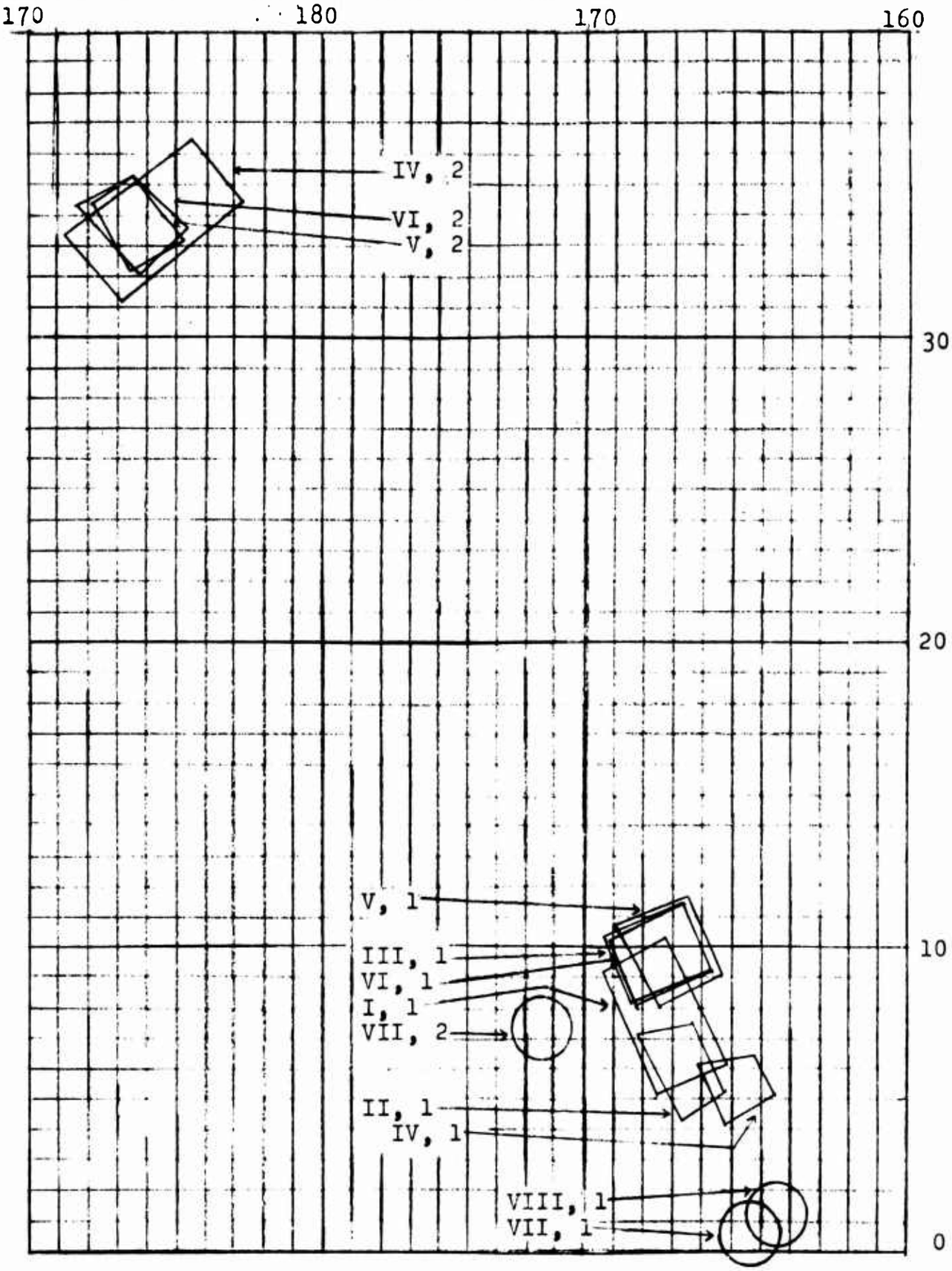

Fig. 1. Mercator projection of the Pacific Ocean test area

SECTION B. ANALYSIS OF THE SCOPE OF THE PACIFIC OCEAN TESTS

On 8 January 1960, the Soviet Government announced that Soviet scientists and designers would test "more powerful rockets for launching heavy earth satellites and for carrying out space flights to the planets of the solar system [5]." This was the only description given of the rockets which were tested. The tests were to take place during the period from 15 January through 15 February 1960 in the areas shown in Fig. 1 and Table 1.

On 22 January 1960, TASS announced the actual testing in the Pacific Ocean of "more powerful ballistic multistage rockets for launching heavy earth satellites and for carrying out space flights to the planets of the solar system [6]." The test area, which was the same as previously announced, covered approximately 43,200 square nautical miles. Testing had begun on 20 January 1960. The next to the last stage of the rocket, with a nose cone simulating the last stage, followed a predetermined trajectory at over 26,000 km/hr and reached the Pacific Ocean impact point which was located 12,500 km from its launching site. The high guidance accuracy achieved has been stressed in every article describing this test. Soviet ships stationed in the area carried special instrumentation. According to official releases, the ships' radar, optical, and acoustical equipment tracked the nose cone and established that it landed less than 2 km away from the calculated impact point.

Sources indicate that the next to the last stage of the rocket, having fulfilled its function, reentered the dense layers of the atmosphere at an altitude of 80—90 km, subsequently disintegrating and partially burning. Professor V. Dobronravov said, "The rocket carried a model of the final stage which, after the conclusion of the current tests, will lift a package of instruments into outer space for further research [7]." Pointing out that the model of the final stage was specially protected so that it could penetrate the denser layers of the atmosphere, he said, "This is of paramount importance for further work on recoverable earth satellites [7]." Doctor of Physicomathematical Sciences B. Nikonov also stated in regard to this test that "The day is not far off when spaceships and space laboratories will be sent to the nearby planets, and powerful extraterrestrial observatories will open new and unique possibilities of studying heavenly bodies [8]." Academician I. Petrovskiy said, "The deviation of this rocket from the [calculated] impact point was less than 2 km. This constitutes one more proof of the extraordinary accuracy of the rocket-guidance system [9]." Candidate of Technical Sciences R. Perel'man said, "The first of the large series of experiments outlined was successful. The mighty rocket

penetrated the dense layers of the atmosphere, reaching a velocity of over 26,000 km/hr, and then with extraordinary accuracy landed in the designated area, only 2 km from the calculated impact point [10]." He further stated, "the first experiment thus demonstrated the high degree of reliability of the equipment which guided the rocket in flight and assured the perfect operation of its various stages [10]." Academician N. Muskhelishvili observes that "The rocket traveled a distance of 12,500 km across the Earth's surface, missing the calculated target by less than 2 km... This proves not only the great accuracy of mathematical calculations, but also the faultless performance of all of its components, especially the navigational system which guided its flight. This is the best proof of the fruitful activity of our scientists, designers, engineers, technicians, and workers [11]."

On 31 January 1960, the second launching of this series was carried out. The 2 February 1960 TASS release stated that the rocket launched was "A more powerful multistage ballistic rocket for launching heavy Earth satellites and for carrying out space flights to other planets of the solar system [12]." The same claims of high guidance-system accuracy were made as before. An editorial in the Soviet journal "*Priroda*" quoted the Hungarian scientist Gyorgy Kulin as saying, "So great is the accuracy that if Soviet scientists were to send a rocket to the Moon and aim it at Copernicus crater they would hit it [13]." The same editorial quotes Professor B. V. Kukarkin as saying that "Such accuracy makes it completely feasible to land a rocket on Mars or Venus [13]." I. Shevlyakov stated that "The testing of powerful multistage ballistic rockets, being carried out by the Soviet Union at this time, is one of the more important preliminary stages of interplanetary travel [14]."

Very little performance data on these tests have been given. Velocity, distance traveled, and altitude were revealed in the news release concerning the first launching (20 January 1960), but were omitted in the second (31 January 1960). The above-quoted remarks, however, suggest that the Pacific Ocean rocket tests were a most important phase in the Soviet space program. In support of this, a TASS release of 29 June 1960 stated that "In order to fulfull its objectives in the conquest of space, the Soviet Union in January of this year carried out the launching of a powerful carrier rocket, minus the final stage, into the Pacific Ocean. On 15 May of this year the Soviet Union, using this carrier rocket, launched a spacecraft-Earth satellite with a weight of 4 tons, 540 kg [15]." This spacecraft was called 'Korabl'-1'. On board the Korabl-1 was placed a 2 1/2 ton pressurized capsule, including ballast simulating the weight of a man and all equipment necessary for a future manned flight. In addition to the capsule, the spacecraft carried equipment which weighed 1477 kg [16].

Professor G. Rosenberg comments that "The significance of these brilliant flights by Soviet spacecraft in the Pacific Ocean lies in the successful solution of some parts of the great barriers to technical control of our acquisition of interplanetary information," and "Our Korabl'-1 spacecraft seems to be the first of a series of space vehicles which will solve the problem of man's penetration into space. First only as a passenger, and then as an astronaut in active control, man in the near future will be sent on space journeys in interplanetary ships [17]."

On 30 June 1960 TASS announced that the testing of "A new version of a powerful multistage carrier rocket" [15] would take place between 5 July and 31 July 1960. There was further stress put on guidance-system accuracy. TASS in one of its communiques stated, "Compare the two rectangles - January, 270 x 160 nautical miles, which is 43,200 square nautical miles; and July, 168 x 102 nautical miles, which is only 17,136 square nautical miles. The second is 2 1/2 times smaller than the first [18]." An analysis of sources indicates that the guidance accuracy of Soviet rockets was so great that their scientists were able to decrease the impact area without hesitation and still be confident of fulfilling their test objectives.

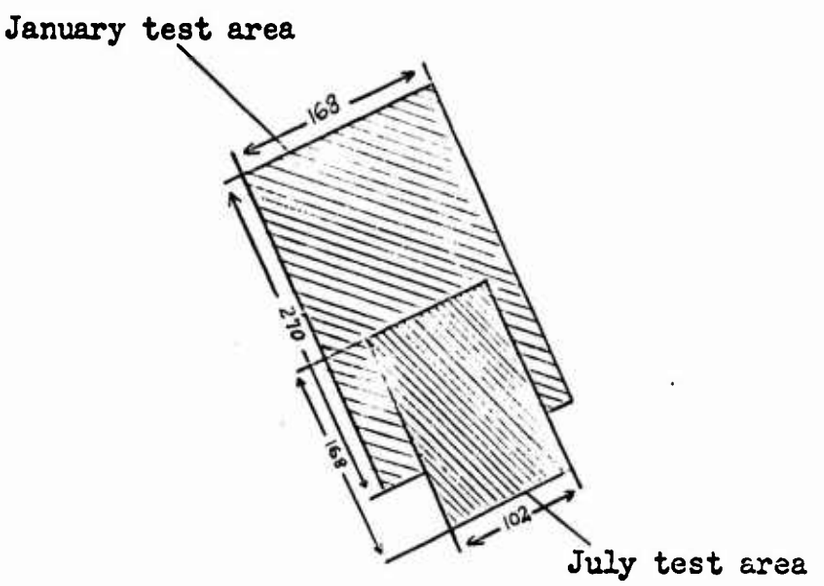

Fig. 2. Comparison of test areas no. 1 and 2 in Series I. [21]

New tests were conducted on 5 and 7 July 1960. The 5 July test was called "A new version of a powerful multistage carrier rocket for space exploration," [19] and the 7 July test was called "A new powerful multistage ballistic rocket

intended for space exploration [20]." TASS designates the former a "carrier rocket," and the second a "ballistic rocket." The question here arises whether this difference in terminology was merely a stylistic feature of reporting, or whether these two tests actually involved two different types of rocket. An analysis of materials indicates that these rockets were of the same type. This is further evidenced by the fact that the tests conducted in January and July 1960 comprised the complete testing schedule for this particular type of rocket. A TASS statement which lends further support to this conclusion indicates that "With the successful launchings of a new version of a powerful multistage carrier rocket, carried out on 5 and 7 July of this year, the planned testing program for this [carrier rocket] type is completely fulfilled [20]."

Holder of the International Incentive Prize in Astronautics, A. Shternfil'd, in order to stress the accuracy of Soviet rockets, prepared a drawing which compares the size of the January testing area with the July testing area (Fig. 3) [21]. He also published two articles on the subject and each includes drawings (Fig. 4 and 5) [21,22].

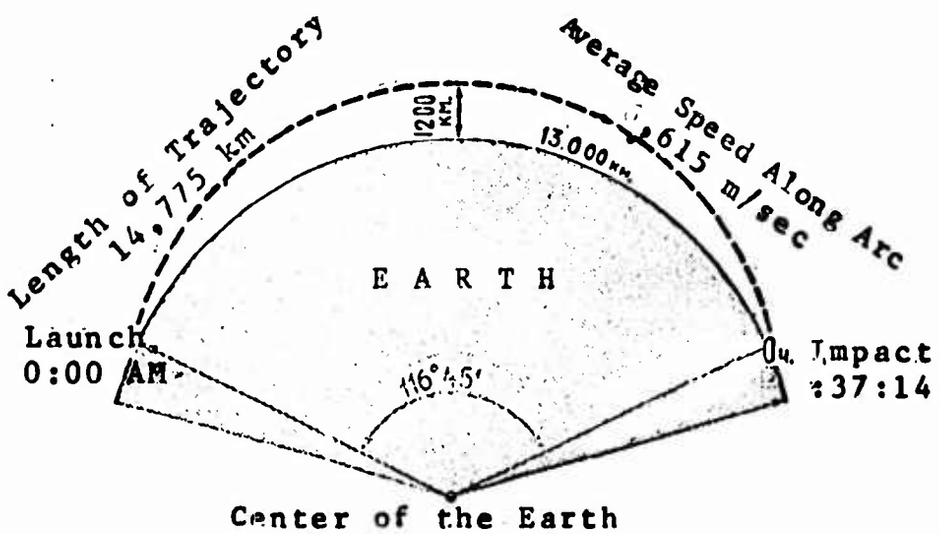

Fig. 3. Carrier-rocket trajectories (July test) as described by A. Shternfel'd [21]

On 19 May 1960, the Korabl'-1 spacecraft was lost in an attempted recovery which took place four days and 64 revolutions after it had been put into orbit. Although the retrorockets functioned normally upon receiving the descent command from Earth, a malfunction in the attitude-control system caused the instrument section and the capsule containing a dummy man, after separating, to enter a new orbit instead of reentering the atmosphere. The last stage of the launch vechicle remained in its original orbit until 17 June when it entered the dense layers of the atmosphere and was des-

troyed. The above indicates that, contrary to Soviet claims, the guidance system had not functioned as perfectly as stated after the two tests in January 1960. This may be the reason why Soviet scientists again tested in July 1960.

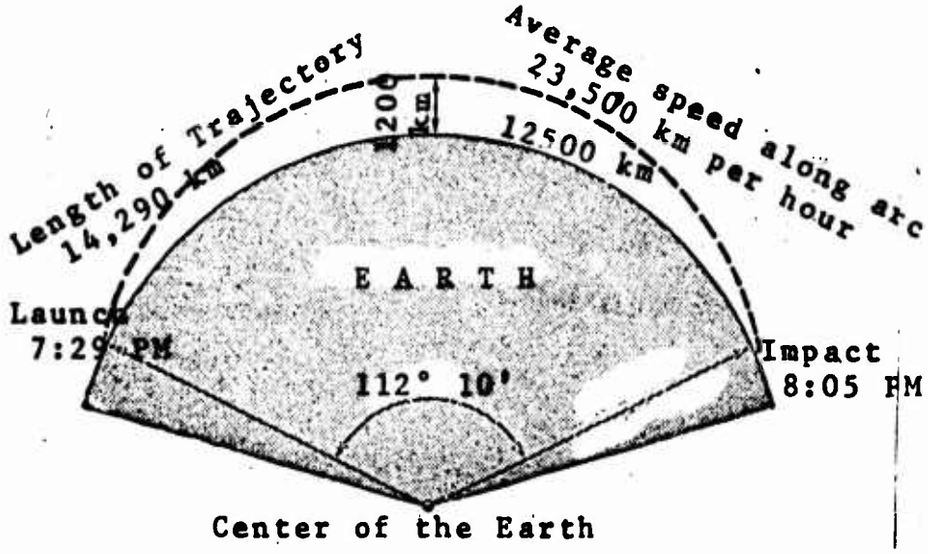

Fig. 4. Carrier-rocket trajectories (January test) as described by A. Shternfel'd [22]

On 11 September 1961 TASS announced a new Soviet launch-vehicle test series (Test Series III). For the first time the rocket was referred to as an "improved version" as follows: "more powerful and improved version of a multistage carrier rocket [23]." This was one of the longest test series conducted, running from 13 September through 28 October, and included eight tests. The tests were originally scheduled to be conducted from 13 September through 15 October but on 14 October, TASS announced that the tests would be extended to 30 October. All eight tests were conducted in the same area (see Figs. 2 and 3). All of the tested launch vehicles traveled over 12,000 km, with the possible exception of the 21 September 1961 test for which TASS stated neither the distance traveled nor whether there was any deviation from the calculated impact point.

The first test in this series was carried out on 13 September 1961. It was clearly stated by TASS that the test involved a "new, more powerful multistage carrier rocket [24]." It was stressed that this launch vehicle traveled more than 12,000 km and missed its calculated impact point by less than one km, whereas tests in the 1960 series missed the impact point by less than two km at best.

The first three tests, conducted on 13, 17, and 21 September, formed a distinct group. The purpose of these tests was to verify the reliability of a new launch vehicle and the

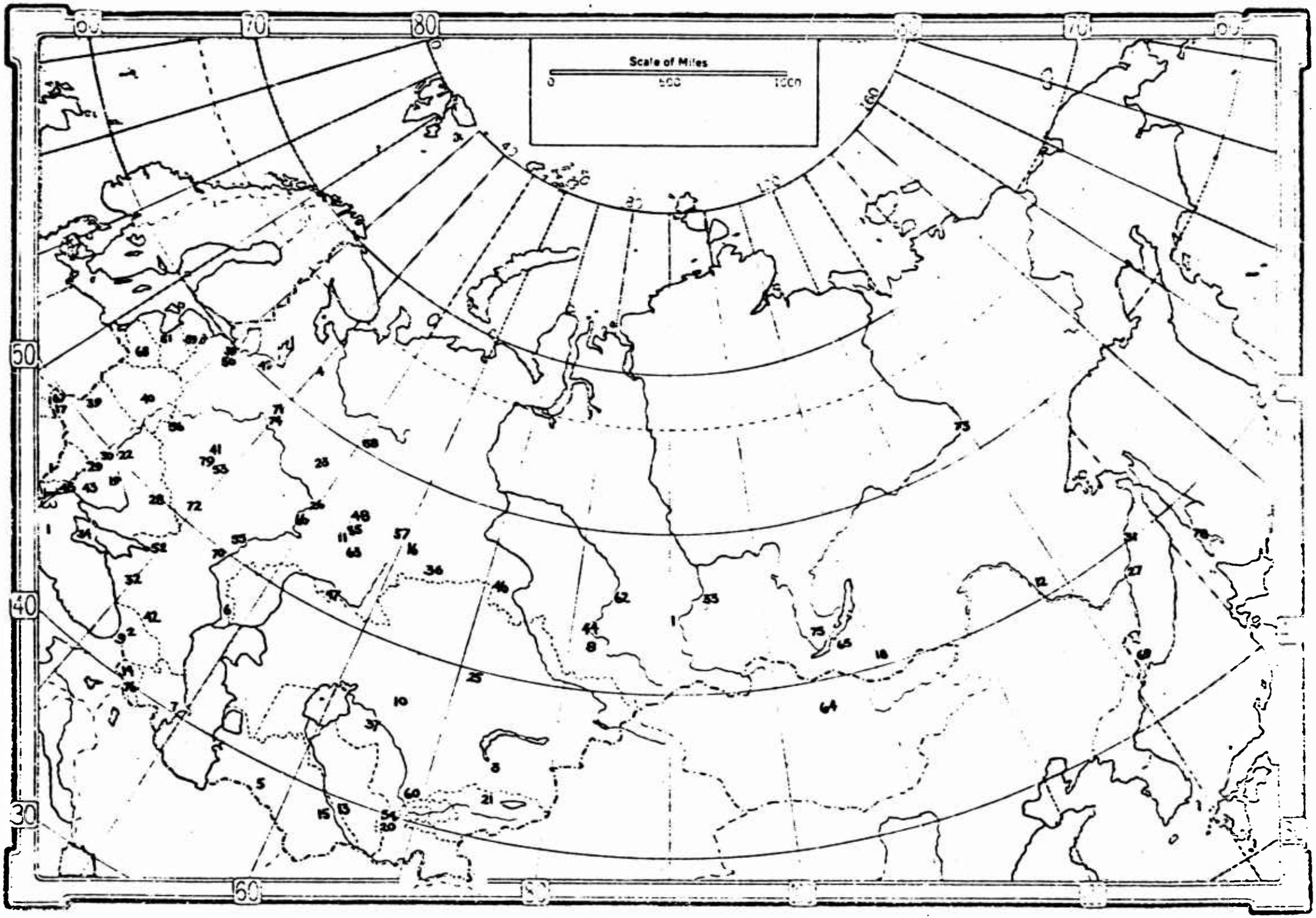

Fig. 5 Distribution of satellite observation stations in the Soviet Union (See attached index of cities.)

Distribution of Satellite Observation Stations in the Soviet Union (Index)

1. Abakan
2. Abastumani
3. Alma Ata
4. Arkhangel'sk
5. Ashkhabad
6. Astrakhan
7. Baku
8. Barnaul
9. Batumi
10. Baykonur
11. Birsk
12. Blagoveshchensk
13. Bukhara
14. Byurakan
15. Chardzhou
16. Chelyabinsk
17. Chernovitskiy
18. Chita
19. Dnepropetrovsk
20. Dushanbe
21. Frunze
22. Gomel'
23. Gor'kiy
24. Irkutsk
25. Karaganda
26. Kazan'
27. Khabarovsk
28. Khar
29. Kishinev
30. Kiev
31. Komsomol'sk-na-Amure
32. Kransnodar
33. Kransnoyarsk
34. Crimea
35. Kungur
36. Kurgan
37. Kzyl Orda
38. Leningrad
39. L'vov
40. Minsk
41. Moscow
42. Nal'chik
43. Nikolayev
44. Novosibirsk
45. Odessa
46. Omsk
47. Orenburg
48. Perm'
49. Petrozovodsk
50. Pulkovo
51. Riga
52. Rostov-na-Donu
53. Ryazan'
54. Samarkand
55. Saratov
56. Smolensk
57. Sverdlovsk
58. Syktyvkar
59. Tartu
60. Tashkent
61. Tbilisi
62. Tomsk
63. Ufa
64. Ulan Bator
65. Ulan Ude
66. Ul'yanovsk
67. Uzhgorod
68. Vilnyus
69. Vladivostok
70. Volgograd
71. Vologda
72. Voronezh
73. Yakutsk
74. Yaroslavl'
75. Yenisey
76. Yerevan
77. Yudino
78. Yuzhno Sakhalinsk
79. Zvenigorod
Zvezdnyy gorodok

accuracy of its guidance system, as well as the development of an interaction between the automatic measuring system and the means of communications to be used when placing spacecraft-satellites into orbit in the future.

Concerning the second test, conducted on 17 September and described as a "multistage carrier rocket," [25] TASS stated that all of its stages operated as expected and that it landed in the immediate vicinity of the impact point of the first rocket. It is stated that the rocket achieved high accuracy [23]. It is stated that on 21 September a third test was conducted for "The verification of the relability of a new carrier rocket [26]."

On 7 October 1961 the Soviet Union tested a launch vehicle, which it described as a "multistage carrier rocket of a new type" with a fundamentally new guidance system [27]. On 12, 15, 22, and 28 October 1961 four additional launch vehicles were tested and the description in each instance was merely "multistage carrier rocket [28, 29, 30, 31]." The distance covered was reported to exceed 12,000 km for all five October launchings, but the rockets' deviation from their calculated impact points was not given.

An analysis of sources indicates that the Voskhod spacecraft may have been orbited by a launch vehicle, the original version of which might have been first tested in the Pacific Ocean in September or October of 1961. This conclusion is based on a number of indications encountered in Soviet literature. For example, Major General T. Mel'kumov, Doctor of Technical Sciences, states, "To launch the three-man Voskhod spaceship into orbit, a more powerful carrier rocket was required [32]." Another statement made by Lt. General N. Kamanin says, "One should say that in comparison with its predecessors, the Voskhod spacecraft was, of course, more sophisticated and was put into orbit by a more powerful carrier rocket [33]." A TASS communique in *Aviatsiya i kosmonavtika* refers to a "new, powerful carrier rocket [34]." This phraseology has been used only in literature discussing the Pacific Ocean tests conducted since September 1961 and with reference to the Voskhod launch vehicle.

In the interval between the July 1960 and September 1961 test series, Soviet scientists launched eight spacecraft. These included both unmanned or manned spacecraft. The unmanned spacecraft consisted of two heavy satellites, or so-called orbital platforms. One was launched on 4 February 1961 with a 6483-kg instrument payload. On 12 February 1961 another orbital platform was launched with the Venus-1 probe. For conducting biomedical experiments, Korabl'-2, 3, 4, and 5 were launched on 19 August 1960, 1 December 1960, 9 March 1961, and 25 March 1961, respectively. Korabl'-2 and -3

carried 2 dogs each. The dogs were recovered from Korabl'-2, but not from Korabl'-3. Korabl'-4 and 5 had one dog each, both of which were recovered.

The Vostok-1 and -2 manned spacecraft were launched on 12 April and 6 August 1961, respectively. Vostok-1 carried Soviet Air Force Major Yu. A. Gagarin and made one orbit around the Earth. Vostok-2 carried Soviet Air Force Major G. S. Titov and made 17 orbits around the Earth.

It is interesting to note that the Soviet press did not reveal the site from which the rockets were launched into the Pacific Ocean. We know that Gagarin's and Titov's spacecraft were launched from Baykonur Cosmodrome. We know that Baykonur Cosmodrome is approximately 12,000 km from the test impact point in the Pacific Ocean, also that the Soviet satellite observation stations are located along the 50th parallel in the following towns (see Fig. 5): Karaganda, Alma Ata, Barnaul, Novosibirsk, Ulan Bator, Ulan Ude, Chita, Yakutsk, Blagoveshchensk, Vladivostok, Khabarovsk, Komsomolsk na-Amure, Yuzhno Sakhalinsk, and others [35, 36].

On 16 October 1962 TASS announced that the Soviet Union [in Test Series IV] would test "A new version of a multistage carrier rocket" [37] between 16 October and 30 November 1962, and that two test areas would be used (see Figs. 2 and 3).

On 18 October 1962 TASS announced that successful launchings of "A new version of a multistage carrier rocket [38]" had been carried out on 16 and 17 October. Distances traveled from the launching site exceeded 12,000 km, and Area I was declared open to sea and air traffic as of 18 October 1962. As for Area II, no TASS release has been found and it is presumed that none was issued. The TASS release of 18 October 1962 did not specify how many tests were conducted, but only that tests had been conducted on 16 and 17 October.

On 12 May 1963 TASS announced a series of tests [Test Series V] involving "An improved version of a carrier rocket [39]," between 15 May and 15 July 1963, in the Pacific Ocean in two areas (see Figs. 1 and 2). These tests were carried out in Area I on 18 and 25 May, 1963 [40] and in Area II on June and July of 1963 [41]. According to a TASS release of 29 May 1963, Area I was reopened to air and sea traffic as of 28 May 1963 and a TASS communique of 11 July 1963 announced the release of Area II effective 11 July 1963.

The tests conducted on 18 and 25 May 1963 covered the usual distance of over 12,000 km. For the June and July 1963 tests, however, distances and exact dates were not revealed. The tests proceeded according to plan. Here it is again assumed that one test was conducted each day. The TASS release of 30 May 1963 stated that tests had been conducted on 18 and 25 May. In Area II, according to the TASS release of 11 July 1963, tests were conducted in June and July, but it is not specified how many or on what dates. Thus we can only conjecture as to whether there was only one test per month or several [42].

On 29 November 1963 TASS announced another test series [Test Series VI] involving a "New improved version of carrier rockets" [43] which would be carried out between 2 December 1963 and 25 January 1964 in the Pacific Ocean in two areas (see Figs. 1 and 2).

On 24 January 1964 TASS announced that launchings of a "New improved version of carrier rockets" had been carried out, and that all stages of the rockets functioned normally [44]. It was stressed that models of the next to the last stage of the launch vehicles reached the predetermined impact area with high accuracy. Areas I and II, as designated in the 29 November TASS release, were reopened to sea and air traffic.

On 1 August 1964 TASS announced that the Soviet Union would carry out another test series [Test Series VII] involving a "New version of a carrier rocket" [45] in two Pacific Ocean test areas (see Figs. 1 and 2). Each area was to have a radius of 65 nautical miles. Testing was to take place in Area I between 4 August and 1 November 1964 and in Area II between 1 October and 30 December 1964. Traffic in these areas was restricted every day from 12 noon to 12 midnight local time. No information is available indicating whether these tests were conducted.

A 10 January TASS release announced that a series of tests [Test Series VIII] on "A new version of a carrier rocket" [46] would be conducted in the Pacific Ocean from 11 January to 1 March 1965. The designated test area had a radius of 65 nautical miles. On 30 January 1965 actual testing began in this area. A model of the next to last stage of the launch vehicle is said to have reached the impact area with great accuracy after traveling over 13,000 km [47].

If the January 1960 tests are compared with those of January 1965, it can be seen that the initial calculated impact area of 43,200 square nautical miles had been reduced to only 13,266 square nautical miles, or an area with a radius of 65 nautical miles, by January 1965.

SECTION C. TRANSLATIONS OF TASS NEWS RELEASES

Test Series I

Based on success achieved in space research by the Soviet Union with the aid of ballistic rockets, and in accordance with Soviet scientists' and designers' plans for scientific research, a more powerful rocket is being developed for launching heavy Earth satellites and carrying out space flights to other planets of the solar system.

With the aim of designing a rocket with such high flight accuracy, during the coming months of 1960 a series of launchings of such a rocket without its final stage will be conducted into the central part of the Pacific Ocean, at a distance from heavy navigation, air routes, and the fishing industry.

The expected impact point of the next-to-last stage of this rocket is in a region bounded by the following coordinates:

North Latitude	9°06'	West Longitude	170°47'
	10°22'		168°22'
	6°16'		166°16'
	5°03'		168°40'

Special ships of the Soviet fleet have been ordered to carry out the necessary measurements in this region.

The first rocket launching will take place between 15 January and 15 February 1960.

In order to assure safety of navigation and aircraft flights during the launching of the rockets into a central part of the Pacific Ocean, TASS is empowered to announce that the Government of the Soviet Union addresses itself to the governments of the other nations whose ships and aircraft may appear at the time and place where the next-to-last stage of the carrier rocket will impact, with the request that appropriate organs of these governments give instructions to ships' captains and aircraft commanders not to enter the water or air space of the Pacific Ocean bounded by the above coordinates [5].

Test Number 1

The Soviet Union previously announced the building of more powerful multistage ballistic rockets which would enable them to launch heavier Earth satellites and carry out space flights to the planets of the solar system.

On the evening of 20 January 1960, such a rocket was launched. The next-to-last stage of the rocket, together with a nose cone simulating the last stage of the rocket, followed the predetermined trajectory precisely, reaching a speed of over 26,000 km/hr. On 20 January at 8:05 P. M. Moscow Time it reached the Pacific Ocean at the predetermined impact point, about 12,500 km from its launching site on the Earth's surface.

The next-to-last stage fulfilled its mission and entered the dense layers of the atmosphere at an altitude of 80--90 km, subsequently disintegrating and partially burning up.

The nose cone of the last stage of the rocket, which was designed to pass through the dense layers of the atmosphere, reached the surface of the water near the predetermined impact point.

Special Soviet ships stationed in the area where the rocket was expected to fall made valuable telemetric measurements of the flight trajectory as the rocket descended.

The nose cone was tracked during its flight in the atmosphere, and its contact with the water was recorded by the ships' radar, optical, and acoustic equipment.

As a result of these measurements, it was established that the rocket impacted less than 2 km from the predetermined point, which confirms the high accuracy of the rocket's guidance system.

The launching of the rocket took place exactly at the predetermined time. The overall flight of the rocket and the operation of all its stages proceeded in accordance with the outlined program.

Various measuring instruments, placed onboard the rocket, enabled ground and ship stations to secure the necessary data for the duration of the flight.

During the flight of the rocket, the functioning of some scientific instruments was checked and necessary measurements were made.

With the aim of further accumulating experimental data, the launching of new, powerful, multistage ballistic rockets will continue. The target area of the rockets will remain in the zone reported in an 8 January 1960 TASS communique [6].

Test Number 2

In accordance with the established program, a launching was carried out on the evening of 31 January of this year of a more powerful multistage ballistic rocket for launching heavy Earth satellites and for space flights to other planets of the solar system.

The next-to-last stage of the rocket, with a nose cone simulating a final stage, reached the predetermined area in the Pacific Ocean on 31 January of this year at 7:58 P. M. Moscow Time.

The rocket's final-stage nose cone was observed during the flight in the atmosphere and at the moment of impact by radar, optical, and acoustical instruments aboard ships.

Based on measurments taken, the high degree of accuracy in the rocket guidance system is stressed again. With the launching on 30 January of this year, this phase of the work is successfully completed. In connection with this, TASS is empowered to announce that the region designated in the TASS communique of 8 January 1960 is free as of 1 February for navigation and aerial flight [12].

Test Series II

In order to fulfill its role in the conquest of space, the Soviet Union in January of this year carried out the launching of a powerful carrier rocket without a final stage into Pacific Ocean.

On 15 May of this year, on the basis of this carrier rocket test, the Soviet Union launched a spaceship-Earth satellite with a weight of 4 tons and 540 kg.

In accordance with plans for further scientific research and experimental design work on space problems, Soviet scientists and designers are presently preparing to test new versions of powerful multistage carrier rockets. Launchings of carrier rockets without final stages will be

carried out into a region of the central Pacific Ocean bounded by the following coordinates:

North Latitude	7°05'	West Longitude	169°09'
	7°53'		167°33'
	5°26'		166°15'
	4°38'		167°51'

Special ships of the Soviet fleet, equipped with measuring instruments, have been dispatched to carry out necessary measurements in the region where the next-to-last stage of the carrier rocket will fall.

The rocket launching will take place between approximately 5 July and 31 July of this year.

In order to assure safety in navigation and aircraft flights during the launchings of the carrier-rockets into a central part of the Pacific Ocean, TASS is empowered to announce that the Government of the Soviet Union requests the governments of the other nations, whose ships and aircraft may appear at the time and place where the next-to-last stage of the carrier rockets will fall, to direct their responsible organs to instruct ships' captains and aircraft commanders not to enter the water or air space of the Pacific Ocean bounded by the above coordinates [15].

Test Number 1

As has been stated, during the period 5 July through 31 July 1960 tests will be conducted in the Soviet Union of a new variation of a powerful multistage carrier rocket for space exploration.

In accordance with the plan outlined on 5 July, one of these rockets was launched. The launch of the rocket was initiated at the specified time. The flight of the rocket was carried out strictly in accordance with the outlined program.

The rocket's dummy final stage, equipped for travel through the dense layers of the atmosphere, reached the water in the immediate vicinity of the designated impact point, approximately 13,000 km from its launch site. Special ships stationed in the central part of the Pacific Ocean, equipped with various types of measuring equipment, conducted measurements and received valuable results in accordance with the program.

With the aim of accumulating further experimental data, tests of powerful ballistic rockets will be continued. Rockets will land in the outlined zone as announced in the TASS communique of 29 June of this year [19].

Test Number 2

On 7 July 1960 the second successful launching of a new, powerful, multistage ballistic rocket intended for space flights, was carried out.

The rocket test was carried out at exactly the predetermined time. The rocket traveled exactly in the predetermined trajectory.

That the model of the final stage reached the surface of the water at exactly the predetermined impact point is verified by data obtained by a special Soviet fleet which was equipped with measuring equipment.

The distance from the launching site to the the impact point was approximately 13,000 km.

With the successful launch of this new variation of a powerful multistage carrier rocket, carried out on 5 and 7 July of this year, the outlined program of this [carrier rocket] variation is completely fulfilled.

As a result of the launching, important data was obtained on the function of the carrier rocket, which is intended for use in the further conquest of space.

Because of the good results from both launchings of the rocket, there is no further requirement for the continuation of testing on this variation of the rocket. TASS is empowered to announce that the region bounded by the coordinates stated in the TASS communique of 29 June 1960 is open as of 8 July of this year for navigation and aerial flights [20].

Test Series III

In accordance with the plan for scientific research and experimental design for the further conquest of space, Soviet scientists and designers prepared to test a more powerful and improved version of a multistage carrier rocket for space exploration. Launching of these rockets without final

stages will be carried out into a region of the central part of the Pacific Ocean bounded by the following coordinates:

North latitude	10°20'	11°30'
	9°10'	8°05'
West longitude	170°30'	167°55'
	166°45'	169°20'

During the launching, ships of the Soviet navy, equipped with special measurment units, will be stationed in the region.

In order to secure safety, TASS is empowered to announce that the Government of the USSR asks the governments of other nations, using the sea and air space of the Pacific Ocean, to instruct their responsible organs to ban ships and aircraft from the water and air space bounded by the above coordinates during the rocket-launching period.

Launchings will be carried out during the period from 13 September to 15 October of this year [23].

Test Number 1

On 13 September at exactly the predetermined time, the successful launching of a new, more powerful multistage carrier rocket was carried out over a distance of over 12,000 km into a region of the central part of the Pacific Ocean. The flight of the rocket and the functioning of all its systems and stages went strictly in accordance with the set program.

The model of the final stage of the carrier rocket reached the water's surface with less than one km deviation from the predetermined impact point, confirming the high accuracy of the guidance system of the rocket. The next-to-last stage of the rocket, having fulfilled its mission, entered the dense layers of the atmosphere and subsequently disintegrated.

The launching of multistage carrier rockets for space purposes will continue in the region designated by TASS on 11 September 1961.

Test Number 2

On 17 September of this year, the second successful launching of a multistage carrier rocket into a region of the central part of the Pacific Ocean was carried out in the Soviet Union.

The flight of the rocket and the functioning of all its systems and stages went strictly in accordance with the set program.

High guidance-system accuracy ensured that the model of the final stage of the carrier-rocket fell in the immediate proximity of the impact point of the first rocket, launched on 13 September of this year.

The attainment of such high accuracy in the guidance system of carrier rockets over a distance of over 12,000 km shows new and impressive achievement in Soviet rocketry.

In accordance with the outlined program, carrier-rocket launchings into designated region will continue [25].

Test Number 3

On 21 September of this year the scheduled launch of a carrier rocket into a region of the central part of the Pacific Ocean was successfully carried out in the Soviet Union.

The aim of the launch was the verification of the reliability of a new carrier rocket and the accuracy of its guidance system, as well as the development of the interaction of the automatic measuring system and the means of communication [used in] placing spacecraft-satellites into orbit in the future.

The model of the final stage of the rocket, designed to pass through the dense layers of the atmosphere, reached the surface of the ocean with high accuracy relative to the target area.

Launchings of carrier rockets in the earlier-designated area will be continued in accordance with the program [26].

Test Number 4

On 7 October of this year, according to schedule and exactly at the designated time, the launch of a multistage carrier rocket of a new type was successfully carried out from the Soviet Union into the central part of the Pacific Ocean. The flight of the rocket and the functioning of all its systems and stages went strictly in accordance with the established program. A fundamentally new guidance system ensured impact in the designated region with very high accuracy.

According to data provided by the measuring system, the model of the next-to-last stage of the carrier rocket reached the water's surface in the immediate vicinity of the intended point of impact. The distance of the point of impact from the launching site was over 12,000 km.

Special vessels in the central part of the Pacific Ocean, equipped with various measuring equipment, made all of the measurments called for in the program.

With the objective of accumulating further experimental facts, launchings of new powerful carrier rockets in the earlier-designated area will be continued [27].

Test Number 5

On 12 October of this year, the scheduled launch of a multistage carrier rocket into a region of the central part of the Pacific Ocean was successfully carried out in the Soviet Union.

The flight of the rocket took place in strict accordance with the set program. The model of the next-to-last stage reached the water's surface with high accuracy relative to the calculated point of impact. Launching was carried out over a distance of over 12,000 km.

In connection with the broadening of the program of scientific investigations for the further conquest of space, TASS is empowered to announce that launchings of carrier rockets into the region of the central part of the Pacific Ocean, designated in the TASS communique of 11 September 1961, will be continued until 30 October 1961 [28].

Test Number 6

On 15 October of this year, the following successful launching of a multistage carrier rocket into the central part of the Pacific Ocean was carried out over a distance of more than 12,000 km in the Soviet Union.

According to tracking stations' data on the trajectory and telemetric measurments, the rocket's flight and the functioning of all of its stages and systems went exactly in accordance with the established program. The model of the next-to-last stage of the rocket reached the surface of the ocean with high accuracy relative to the intended point of impact.

In accordance with the TASS communique of 14 October of this year, launchings of carrier rockets in the earlier-designated area will be continued [29].

Test Number 7

On 22 October of this year, the following launching of a multistage carrier rocket was carried out into the central part of the Pacific Ocean. The rocket traveled over 12,000 km, the model of the next-to-last stage of the rocket reaching the calculated point of impact with high accuracy. All of the rocket's systems and measuring complex functioned perfectly. In accordance with a TASS communique of 14 October of this year, launchings of carrier rockets into the earlier-designated area will be continued [30].

Test Number 8

On 28 October of this year the scheduled launch of a multistage carrier rocket into a region of the central part of the Pacific Ocean was carried out over a distance of more than 12,000 km in the Soviet Union. The flight of the rocket took place in strict accordance with the established program. The model of the penultimate stage reached the water's surface with high accuracy relative to the calculated point of impact.

With this launch, the present program of scientific research is successfully completed. In the process of conducting launchings of carrier rockets, valuable scientific data essential to the further conquest of space have been obtained. The launching of a multistage carrier rocket with high accuracy over great distances bears witness to new major successes in Soviet rocketry.

TASS is empowered to announce that the region bounded by the coordinates in the TASS communique of 11 September 1961 and 19 October 1961 is open to sea navigation and aircraft flights [31].

Test Series IV

As was previously announced by TASS in January and July 1960 and in September 1961, the Soviet Union has carried out launchings into the Pacific Ocean of powerful carrier rockets without final stages [to be used] for space applications.

In accordance with the scientific-research and experimental-design program for the further conquest of space, Soviet scientists and designers have made preparations for testing a new variation of a multistage carrier rocket for space applications. Experimental launchings of these rockets, also without final stages, will be carried out in two regions of the Pacific Ocean bounded by the following coordinates:

Area I		Area II	
North latitude	West longitude	North latitude	East longitude
6°52'00"	165°25'00"	36°38'00"	175°50'00"
5°10'00"	164°36'30"	33°40'00"	171°10'00"
4°21'30"	166°16'30"	31°28'00"	173°03'00"
6°07'00"	167°08'00"	34°25'00"	177°45'00"

In order to carry out necessary measurements on the descent of the carrier rockets' next-to-last stages, special ships of the Soviet fleet, equipped with the necessary measuring equipment, will be stationed in the area.

Rocket launchings will be carried out during the period from 16 October to 30 November of this year. In order to assure safe ocean navigation and aircraft flight during the carrier-rocket launchings into the Pacific Ocean, TASS is empowered to announce that the Government of the Soviet Union asks the governments of the other countries whose ships and aircraft may appear in the vicinity of the calculated impact point of the next-to-last stage of the carrier rockets, during the launch period, to direct responsible organs of government to instruct ships' captains and aircraft commanders not to enter the water and air space of the Pacific Ocean bounded by the above coordinates [37].

Test Number 1

On 16 and 17 October of this year launchings of a new variation of a multistage carrier rocket for space applications were successfully carried out from the Soviet Union to a region of the central part of the Pacific Ocean more than 12,000 km away from the launching site.

The launchings of the rockets and the functioning of all of their stages went in accordance with the established program. The nose cones of the next-to-last stages of the carrier-rockets reached the water's surface with high accuracy relative to the calculated impact point.

Because of the success of these tests, TASS is empowered to state that as of 18 October of this year, Area I, bounded by the following coordinates, as shown in the TASS communique of 16 October 1962, is temporarily (unless otherwise specified) open to sea navigation and aerial flight [38]:

North latitude	6°52'00"	West longitude	165°25'00"
	5°10'00"		164°36'30"
	4°21'30"		166°16'30"
	6°07'00"		167°08'00"

Test Series V

In furthering the conquest of space, Soviet scientists and designers are preparing to test an improved version of a carrier rocket for space applications. Experimental launchings of these rockets without final stages will be carried out into the Pacific Ocean area bounded by the following coordinates:

Area I		Area II	
North latitude	West longitude	North latitude	East longitude
11°41'	167°49'	35°23'	173°52'
9°03'	166°34'	33°10'	175°24'
8°03'	168°45'	32°08'	173°56'
10°41'	170°00'	34°21'	172°23'

Necessary measurements of the descent of the carrier-rockets' next-to-last stages in the area will be carried out by special ships of the Soviet fleet equipped with the necessary measuring apparatus.

Rocket launchings will be carried out during the period from 15 May to 15 July 1963. In order to secure safe ocean navigation and aircraft flight during the carrier-rocket launchings into the Pacific Ocean, TASS is empowered to state that the Government of the Soviet Union asks the governments of other countries, whose ships and aircraft may appear in the vicinity during the period in which the next-to-last stages of the carrier rockets will fall, to direct their responsible organs to instruct ships' captains and aircraft commanders not to enter the water or air space of the Pacific Ocean bounded by the above coordinates [39].

Test Number 1

On 18 May and 25 May of this year in the Soviet Union, the launching of an improved version of a carrier rocket for space

applications was successfully carried out in the central Pacific Ocean over a distance of 12,000 km. The rockets' flights and the functioning of all their stages were carried out in accordance with the outlined program. The models of the next-to-last stages of the carrier rockets landed with high accuracy in the predetermined area.

The successful launchings of these improved carrier rockets secures the further development of Soviet science in the conquest of space and the perfection of our knowledge of the planets of the solar system. As a result of the success of the tests, TASS is empowered to announce that as of 28 May of this year, Area I, bounded by the coordinates shown in the TASS communique of 12 May 1963, is open to navigation and aerial flight [40].

North latitude	11°41'	West longitude	167°49'
	9°03'		166°34'
	8°03'		168°45'
	10°41'		170°00'

Test Number ? (conducted in June and July, but number of tests not disclosed)

In June--July of this year in the Soviet Union, launchings of improved versions of a carrier rocket for space applications were successfully carried out into the central part of the Pacific Ocean. The rockets' flight and the functioning of all of their systems were exactly in accordance with the outlined program.

In connection with this [program], TASS is empowered to announce that from 11 July of this year, the second region, bounded by the coordinates outlined in the TASS communique of 12 May 1963, is open to ocean navigation and aircraft flight [41].

North latitude	35°23'	East longitude	173°52'
	33°10'		175°24'
	32°08'		173°56'
	43°21'		172°23'

Test Series VI

In connection with the broadening of the program of scientific investigations for the further conquest of space, TASS is empowered to announce that from 2 December 1963 to 25 January 1964 the Soviet Union will launch new improved versions of carrier rockets for space applications into the sea area

bounded by the following coordinates:

Area I		Area II	
North latitude	West longitude	North latitude	East longitude
10°25'	170°31'	35°20'	173°40'
11°42'	167°52'	33°02'	175°40'
9°14'	166°42'	32°02'	173°52'
8°00"	169°21'	34°20'	171°52'

To secure safe ocean navigation and aircraft flight during carrier-rocket launchings into the Pacific Ocean, the Government of the Soviet Union asks other governments, whose ships and aircraft may appear in the vicinity during the period when the next-to-last stages of the carrier rockets will impact, to direct their responsible organs to instruct ships' captains and aircraft commanders not to enter the water and air space of the Pacific Ocean bounded by the above coordinates [43].

Tests Number 1 & 2

In accordance with the program, launchings of new, improved versions of carrier rockets for space exploration were successfully carried out from the Soviet Union into the Pacific Ocean. The rockets' flight and the functioning of all their stages went normally.

Models of the next-to-last stages of the carrier-rockets reached the water's surface in the predetermined area with high accuracy. In connection with this, TASS is empowered to announce that as of 25 January 1964, exactly as stated in the November 1963 TASS communique, the sea and air space of the regions of the Pacific Ocean bounded by the following coordinates are open to navigation and aircraft flight [44]:

Area I		Area II	
North latitude	West longitude	North latitude	East longitude
10°25'	170°31'	35°20'	173°40'
11°42'	167°52'	33°02'	175°40'
9°14'	166°42'	32°02'	173°52'
8°00'	169°21'	34°20'	171°52'

Test Series VII

In accordance with the program for further space exploration, the Soviet Union this summer will carry out the testing of new versions of a carrier rocket. The launchings of these rockets will be into circular areas of the Pacific Ocean, each having a radius of 65 nautical miles; their centers are [located] at the following coordinates: (1) 0°65'N and 165°40'W; (2) 7°15'N and 172°35'W.

Rocket-descent measurements in the regions will be made by special Soviet ships equipped with the appropriate equipment.

The Summer testing program will remain in effect until the end of 1964. The area with the center at 0°65'N and 165°40'W will be utilized from 4 August to 1 November of this year. The area located at 7°15'N and 172°35'W will be utilized from 1 October to 30 December of this year.

In order to assure safety, TASS is empowered to announce that the Government of the Soviet Union asks governments of other nations, using the sea and air space of the Pacific Ocean, to direct their responsible organs to ban ships and aircraft from entering the sea or air space of the area every day from 12 noon to 12 midnight local time.

Any changes occurring in launch time, in the coordinates designating the regions, or in the lifting of all restrictions in these regions will be announced by TASS in supplemental releases [45].

Test Series VIII

With the aim of furthering space exploration and accumulating experimental data, the Soviet Union during the period from 11 January through 1 March 1965 will launch a new version of a carrier rocket for space exploration into a circular area of the Pacific Ocean, an area having a radius of 65 nautical miles with its center at the following coordinates: 1°35'N and 164°01'W.

TASS is authorized to announce that to assure safety of navigation the Government of the Soviet Union asks the gover ments of the other nations, which are using the sea and air routes of the Pacific Ocean, to direct their responsible organs to ban ships and aircraft from this region during the second half of each day, from 12 A. M. to 12 P. M. local time [46].

Test Number 1

On 30 January of this year, the Soviet Union successfully launched a new version of a carrier rocket for space applications into the Pacific Ocean. The launching distance was over 13,000 km. The rocket's flight and the functioning of all its stages were exactly in accordance with the outlined program. The model of the next-to-last stage of the carrier rocket reached the water's surface in the predetermined area with high accuracy.

As a result of the success of these tests, TASS is empowered to announce that as of 3 February of this year, the region designated in the TASS communique of 9 January, and published on 19 January 1965, is open to navigation and aircraft flight [47].

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ABSTRACT

This comprehensive report is based on Soviet-Satellite open sources published 1960-1965. It is the seventh in a series and deals with the Soviet launch-vehicle tests carried out in the Pacific Ocean from January 1960 through January 1965. Direct quotations from Soviet sources have been literally translated in order to facilitate the comparative analysis of official announcements. This analysis is based primarily on the presupposition that there is some significance in the fact that different expressions have been used to describe various tests. The report consists of three sections: A) Summary and analyst's discussion, B) Analysis of the scope of the Pacific Ocean Tests, and C) Translations of TASS news releases. Section A contains a summary of these tests in tabular form, together with a Mercator projection of the test areas. The table includes announcement dates, test dates, geographical location of each test area, distances between the launch and impact points, if given, and descriptions of rockets launched. Data in the table correspond directly to TASS releases and to the Mercator projection showing the locations and dimensions of the test areas. The analyst has divided Soviet Pacific Ocean tests into three basic groups. The first group includes tests conducted between 20 January and 8 July 1960 (to determine reliability and accuracy of the guidance system, measuring instruments, and communications equipment). The second group of tests was conducted in 1961 and 1962 during which time a new type of rocket was introduced. The last group of tests starts with Test Series VI, announced on 29 November 1963. The analyst conjectures that with this series the Soviets started testing some recoverable and reuseable versions of launch vehicles which will be used to launch heavy spacecraft into Earth orbit, as well as sections of space stations to be assembled in orbit. There are 47 references.

WA 57 Task ____ Rpt 7

ATD Report No. 65-83

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