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E.O. 13526, SECTION 5.3(b)(3)

ISCAP APPEAL NO. 2009-068, document no. 114
DECLASSIFICATION DATE: February 25, 2015

SECRET [redacted]

NORTH AMERICAN AIR DEFENSE COMMAND

WIR

WEEKLY INTELLIGENCE REVIEW (U)

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Lunar panorama (in 2 sections) photographed by the Soviet probe Luna 9.
Parts of braking unit can be seen in upper half. (From Izvestia)

7-66
18 Feb 1966
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WIR 7/66
18 Feb 66

FEB 21 1966

Postal Registry No. 259/66

NORAD Weekly Intelligence Review

Issue No. 7/66, 18 February 1966

The WIR in Brief

NOTE: Pages 30, 31, 34, 35, 38, 39, 42, and 43 of this issue are blank.

Missile Range Firing Log

US radar stations detected the following Soviet space/missile launches during the period 1 January-14 February 1966:

Approximate Time & Date of Launch	Propulsion System	Launch Site	Range
0820Z, 07 Jan	Cosmos 104*	Tyuratam	Orbital
0830Z, 22 Jan	Cosmos 105*	Tyuratam	Orbital
0717Z, 24 Jan	SS-4 MRBM	Kapustin Yar	1050 nm
1235Z, 25 Jan	Cosmos 106#	Kapustin Yar	Orbital
0736Z, 31 Jan	SS-7 ICBM	Tyuratam	3400 nm
1142Z, 31 Jan	Luna 9**	Tyuratam	Lunar
1219Z, 05 Feb	Failure##	Tyuratam	Failed
0210Z, 09 Feb	SS-4 MRBM	Makat	1050 nm
0840Z, 10 Feb	Cosmos 107*	Tyuratam	Orbital
1803Z, 11 Feb	Cosmos 108#	Kapustin Yar	Orbital

*Launched by SS-6 ICBM booster-sustainer, orbited by light Lunik upper stage.
#Launched by 2-stage vehicle.
**Launched by SS-6 ICBM booster-sustainer, injected into parking orbit by heavy Venik upper stage, injected into transfer trajectory toward the Moon by 4th interplanetary stage.
##Unknown launch vehicle
(Diyarbakir & Shemya RADINT; various ELINT sensors)
(~~SECRET~~ NO FOREIGN DISSEMINATION -- Releasable to US, UK & Canada)

Portion identified as non-responsive to the appeal

significant
intelligence
on space
developments
and trends

Cosmos 107 a Photorecce Satellite; Soviets Unusually Busy this Winter

The Soviets launched Cosmos 107 from Tyuratam at about 0840Z, 10 February 1966, into an orbit with an Equatorial inclination of about 65 degrees and an orbital period of about 89.78 minutes. The Soviets announced it as another scientific research vehicle of the Cosmos series, but all indications are that it is the 44th in a series of Soviet recoverable photoreconnaissance satellites which bear the Cosmos designation.

The Soviets have been unusually busy with their photorecce satellite program this winter. Seven vehicles have been launched since mid-October, compared with 3 for mid-October to mid-February in each of the two preceding winters.

Five of the 7 launched since mid-October 1965 were orbited by the SE-3 launch system, and two by the SE-4. Both systems use the SS-6 ICBM booster-sustainer for launch, but the SE-3 injects its payloads into orbit with the light Lunik upper stage, the SE-4 does it with the heavy Venik upper stage.

The SE-3 payload weighs about 10,000 pounds and carries a camera system of medium resolution (20-30 feet). Four cameras are carried:

- Two main cameras perform the primary photographic mission. Each is aimed about 16 degrees off the vertical, with a slight overlap along the Earth trace under the vehicle's line of flight.
- One is a horizon camera which provides a local vertical reference for the main cameras.
- The fourth is an indexing camera which locates the gross area within which the main cameras are taking pictures.

The SE-4 payload weighs about 12,000-15,000 pounds, carrying a camera system of high resolution (5-8 feet). This system is able to make a controlled roll of up to 45 degrees with respect to the line of flight in order to photograph selected targets offset to the flight path.

Five cameras are carried: 2 primary mission, 2 horizon, and 1 indexing. Two horizon cameras are needed for the field of view required to establish the roll position of the satellite.

The two photographic systems complement each other. The medium-resolution system provides a geodetic and mapping function from which gross patterns of change can be detected. Once areas of potential interest have been recorded by this system, the high-resolution system can be used to obtain more detailed coverage which show the characteristics of specific targets.

(NORAD; FTD)

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Reds Use US's 'Echo' Satellites for Making Geodetic Measurements

The Soviets since 1962 have been using optical observations of the US's large balloon-type Echo-series satellites for making geodetic measurements across the USSR. This work apparently is now to be extended into Eastern Europe. Latvian and Rumanian scientists reportedly plan to take the same kind of data by simultaneously photographing Echo II from Riga and Bucharest.

The accuracy of geodetic measurements obtained by optical tracking of a passive satellite is probably not as great as the US hopes to achieve by electronic tracking of Geos and Secor satellites, but it is faster and more accurate than conventional surface-triangulation methods.

Geodetic measurements aid in determining more accurately the size and shape of the Earth and the distances between various points on it. Accurate determination of such distances is helpful in targeting ICBMs against small targets, such as hardened enemy ICBM sites.

(CIA; NORAD)

~~(CONFIDENTIAL)~~

The Luna 9 Event, According to Soviet Press Reports

(Following is a NORAD summary of Soviet press items on the Luna 9 event. Times given are assumed to be Moscow time. In some cases this was specified.)

The Spacecraft. The Luna 9 vehicle which was injected into transfer trajectory toward the Moon weighed 1,583 kilograms, half of this weight consisting of fuel. The spacecraft consisted of 3 main sections:

- An engine section which made the inflight course correction and supplied the braking action for the landing.

- A flight-control section which controlled the inflight course correction and the final landing.
- The final payload which photographed the Moon and transmitted video of the photography to the Earth.

The engine section consisted of the engines, a fuel-pumping system, apparatus to insure proper burning, and fuel tanks.

The control section included gyroscopes, electro-optical devices for orienting the station in space, a radio for flight control, a timer-programer, a radio system for the soft-landing, a power supply, and a vernier system for orienting the station properly for the inflight course correction and for the landing. This section was in 2 hinged parts which separated before the braking action took place.

The station itself, which was sealed to maintain a constant pressure, contained a radio transmitter-receiver, program-control devices, a heat regulator, scientific apparatus, a power supply, a TV system, antennas, shock absorbers, and petal-like feet.

Launch Date and Target. The launch date was so chosen that the Moon would be relatively high above the Earth's Equator, which would provide for longer line-of-sight communications time each day between the Moon and the USSR.

The probe was aimed so that it would land during the lunar "morning," that is, near the terminator line. This would provide the most favorable working temperature for the electronic equipment aboard the station, since the Sun at this time would be low in the lunar sky. It would also cast long shadows during the early part of the photographic mission.

The Flight. A rocket package first put Luna into a parking orbit of the Earth with an orbital inclination of 52 degrees, an apogee of 224 kilometers, and a perigee of 173 kilometers. At a predetermined time it was injected into a trajectory toward the Moon on a trip which would last about 3.5 days.

Observation indicated that Luna 9 would pass the Moon at a distance of 10,000 kilometers from its center if the spacecraft's flight path was not corrected. On 1 February the ground station sent Luna 9 the instructions to make a course correction. The spacecraft oriented itself with vernier controls to the Sun and perpendicular to the surface of the Moon. At 2229 hours, 1 February, the correction engines were switched on and the craft's speed changed by 71.2 meters per second. (WIR note: see page 37.)

The ground station later verified the accuracy of the correction and computed the time at which the braking engine should be turned on. At 1600 hours, 3 February, data was sent from the Earth to the spacecraft for braking prior to landing. Luna 9 oriented itself vertically to the Moon's surface about an hour before the landing was to be made, when it was 8300 kilometers from the Moon.

One of the characteristics of a system of hyperbolic trajectories was used in orienting the craft: if the altitude at which the braking engine is to be turned on is given, then for that altitude there is a distance from the center of the Moon (about 8500 kilometers) at which the direction to the Moon's center coincides with the needed direction of thrust at the beginning of braking. It should be noted that this distance does not, from a practical standpoint, depend on the magnitude of the deviation of the actual from the computed trajectory. In braking, of course, the axis of thrust has to be aligned with the speed vector.

Braking began on command of the radio-altimeter when Luna 9 was 75 kilometers above the Moon's surface and continued for 48 seconds. The shock absorbers were readied and the craft's speed was slowed from 2600 meters to several meters per second. When the station reached the Moon's surface, it separated from the engines, which landed nearby.

Touchdown came at 2145:30 hours, 3 February at 0708N-6422W. Four minutes and 10 seconds later the antennas opened and the first transmitting session began. At 0450 hours, 4 February, the TV system began its survey of the lunar surface and transmissions began. In the next 3 days, photo-TV images were sent regularly, along with telemetric data. (WIR note: see page 40.)

<u>The Video System</u>. The TV camera, after the landing, was about 60 centimeters above the lunar surface, permitting a range of vision of about 1.5 kilometers. Its angular resolution was about 3 minutes of arc. In comparison, a man's range of vision on the Moon would be about 2.3-2.5 kilometers and the angular resolution of his vision would be about 1 minute of arc.

The sensitivity of the TV "eye" on Luna 9 could be varied with the intensity of the illumination, either by means of photoelectric devices carried or by command from the Earth.

Pictures taken during the 3d transmitting session were the best, when the Sun was at an angle of 27 degrees. The Sun was too low upon landing, so photography was delayed. When the first video transmission was held, the sun was about 7 degrees above the horizon.

The power supply was the limiting factor in the number of transmitting sessions held. Three were programed but some power still remained, and pictures were received 75 hours after touchdown.

The axis of the TV camera was tilted downward at an angle of about 30 degrees toward the east. This resulted in photographic coverage of only 300 degrees of the lunar surface, although the apparatus was capable of 360 degrees coverage. Coverage in a westerly direction shows only a black sky.

A 2-faceted mirror was used to measure distances. It divided the landscape into 6 strips of stereo pairs with bases of about half a meter each.

The pictures showed that the station's angle of tilt had changed between the 2d and 3d transmitting sessions. Also, the camera moved a few centimeters. This enhanced the stereo effect.

The pieces of the station which can be seen in the published photography appear to be large, but that is because they are close.

Scientific Data. The station indicated that cosmic rays are the principal factor in radiation on the Moon, where the dosage is 30 millirads per day. The Moon's surface itself radiates as an effect of primary cosmic radiation. This fact may help us to determine the chemical composition of the Moon.

QUESTION AND ANSWER SESSION

(Following is a summary of the most significant points raised during a question-and-answer period which followed a 10 February press conference about Luna 9. Questions and answers are summarized, not given verbatim as published. Some are omitted.)

Q. What caused the station to shift position?
A. This is not known, but the weight of the station and changes in temperature of the surface could be factors.

Q. Did Luna 9 have solar batteries?
A. No. They were not necessary for this mission.

Q. What is next in the program for sending cosmonauts to the Moon?
A. Perhaps a flight of cosmonauts around the Moon. But this is a question. There are many problems requiring study.

Q. Is the soft-landing procedure 100% safe?
A. The technical problems are 100% solved, but this does not bar accidents. You can never guarantee 100% reliability.

Q. Can you name the basic steps which must be taken between a soft-landing and sending cosmonauts to the Moon?
A. There are many technical problems, but the speed of return to Earth from the Moon, which is much higher than orbital speed, is one of the biggest problems.

Q. What about Sir Bernard Lovell's prediction that the USSR will send men to the Moon in early 1967?
A. I don't know on what basis Lovell said this.

Q. Can you give the weight of the control section and braking section?
A. The over-all weight was 1.5 tons, the station itself 100 kilograms.

Q. Was all the equipment Soviet built or was some of it built in other socialist nations?
A. All of it was built in the USSR but we hope in the future to use equipment from the other socialist nations.

Q. Will vehicles of the Luna-9 type land on Venus in the not-distant future?
A. I do not exclude this possibility, but landings on Venus have special problems, such as atmospheric temperature and pressure.

Q. Are more Luna-9 vehicles expected this year?
A. This is an interesting question, because of problems of international law and international relations.

Q. Is the Moon now contaminated by Earth's bacteria?
A. Special measures were taken to prevent this.

Q. When will the first samples be made of the lunar soil, seismograph recordings made, temperatures taken -- is this months away or years?
A. I think in months or tens of months.

Q. What kind of signals were used to transmit TV -- figures or analog modulation?
A. Ordinary frequency modulation.

Q. Will the photographs made by Luna 9 be published?
A. The Academy of Sciences proposes to publish a special issue about the event and pictures of the lunar surface. Materials will also be published in scientific journals.

Q. Was any information sent other than TV, such as results of experiments?
A. The dosimetry background detected has already been mentioned. Very detailed information was sent back about the working of Luna 9 itself.

Q. Is a special name to be given to the historical place of this lunar landing? If so, what is it?
A. I think that this must be given thought. American scientists called Ranger 7's landing place the "Sea of the Known." However,

astronomers have their own international rules and do not permit anyone to assign names without permission of the International Astronomer's Union. It is premature to speak of this.

Q. How heavy must be the equipment for delivering men to the Moon and returning them to the Earth?
A. Total weight of the rocket would be thousands of tons.

Q. When can we expect the first communications from Venera 2 and Venera 3?
A. These stations are traveling and working as planned and regular communications sessions have been held with them. They will reach Venus about 1 March.

Q. How many lines are there in pictures of the Moon transmitted to the Earth?
A. There are 6,000 lines in the whole panorama; a session lasted 100 minutes; 4 sessions were held.

Q. Does the USSR claim the Moon?
A. No.

Q. How will this question be decided?
A. Let the jurists decide.
(Izvestia; Red Star)
(UNCLASSIFIED)

Space Listing and Over-All Space Status Report

The over-all space-vehicle status as of 1000Z, 16 February 1966, was as follows:

	USA	UK	Can	Italy	France	USSR	Total
Payloads orbiting Earth	164	2	2		2	42	212
Payloads orbiting Sun	9					10	19
Payloads on Moon	5					5	10
Debris orbiting Earth	631	1	2		5	146	785
Debris orbiting Sun	8					2	10
Totals	817	3	4		7	205	1036

	USA	UK	Can	Italy	France	USSR	Total
Payloads decayed or de-orbited	170			1		102	273
Debris decayed	129					575	704
Totals	1116	3	4	1	7	882	2013

A listing of payloads still orbiting the Earth as of 1200Z, 11 February 1966, is shown on page 41.
(NORAD Space Defense Center)
(OFFICIAL USE ONLY)

Cosmos 108 Probably a Scientific Vehicle; Payload May Have Failed

Cosmos 108, which the Soviets launched from Kapustin Yar (KY) about 1803Z, 11 February, is believed to be a scientific vehicle, as the Soviets claim. It is the second such spacecraft launched from KY this year. The SS-4 MRBM booster-sustainer and KY Cosmos 3d stage were used to launch and inject Cosmos 108 into orbit.

It is the first nighttime KY launch since Cosmos 51, which was launched 9 December 1964. Cosmos 108 may have been intended to study night lighting conditions. The Soviets have announced that Cosmos 51 studies one visible and two ultraviolet regions of the spectrum at night. A lack of ELINT after Orbit One, however, suggests that Cosmos 108 may have suffered a payload failure.
(NORAD)
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5 Feb Launch Fails, Probably Test of SS-9 ICBM in Space Role

A vehicle which the Soviets launched from Tyuratam (TT) at about 1220Z, 5 February, failed and fell into the Pacific some 23 minutes and 50 seconds later.

The launch appears to have been a repeat of a space event of 16 December 1965 which also failed: the two vehicles were similar [redacted] It is concluded, therefore, that the launch vehicles were the same. Analysis of telemetry internals does not permit identification of the 5 February launch vehicle, but that used on 16 December has been identified as an SS-9 ICBM plus a third stage.

50X1 and 3, E.O.13526

Both launches are assessed as space events rather than missile events, despite use of the SS-9:

- Both 2nd stage boosters fell beyond a currently announced Soviet impact area in the Pacific.
- There were no missile-range instrumentation ships in the Pacific to monitor these events.
- The use of a third stage is more consistent with a space launch than a missile launch.
- Inclination of trajectory was the 65 degrees used for most TT launches.
- Velocity of the booster at apogee (before ignition of the third stage) was 96 percent of orbital velocity.

In both cases the 3d stage was not programmed for ignition until about 7 minutes after apogee, at about 100 n.m. altitude. On 16 December the 3d stage ignited but, due to its tumbling, it exploded. On 5 February the 3d stage separated but failed to ignite and fell into the Pacific along with the 2d stage.

Both events are assessed as test launches of an SS-9 and a 3d stage. The Soviets could intend to use this configuration for any one or more of the following purposes:

- To replace the SS-6 ICBM as a general-purpose space booster.
- To replace the SS-6 ICBM specifically in a new photo-reconnaissance-satellite system.
- To test elements of a fractional-orbit bombardment system (FOBS).
- To place a rendezvous package into orbit, to be used later in conjunction with a manned flight.
- To be used in a role requiring a near-Earth parking orbit.

(NORAD)
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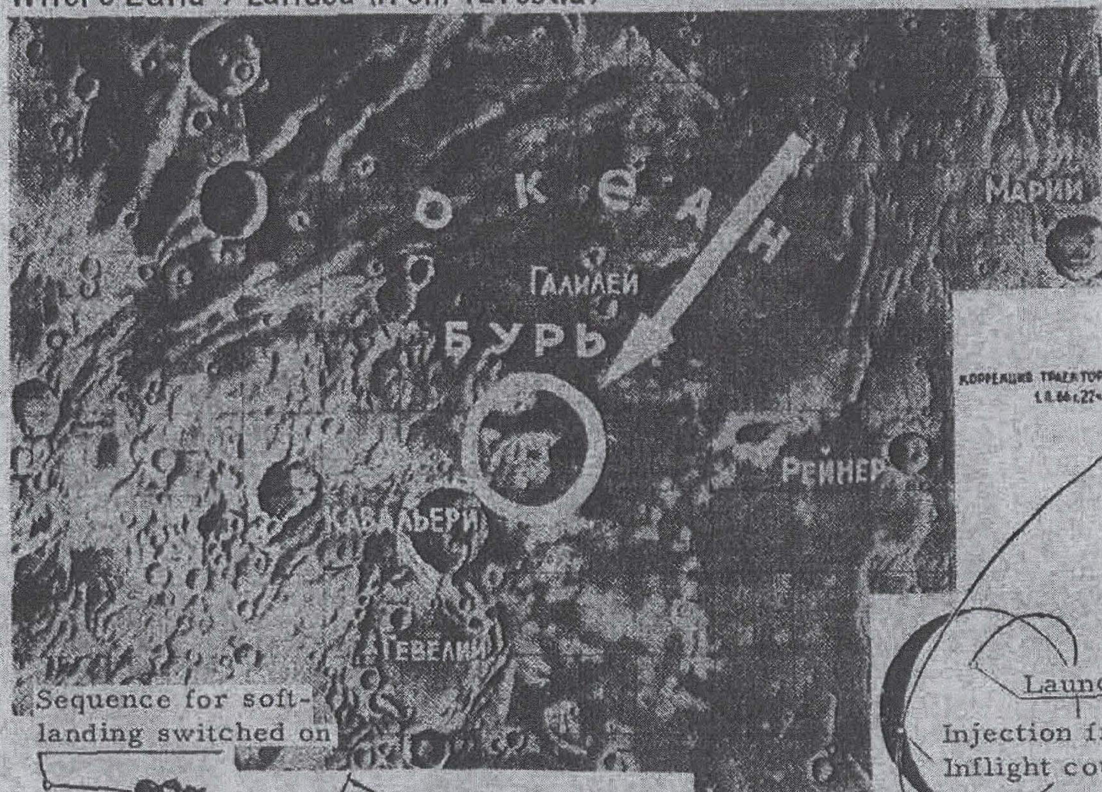
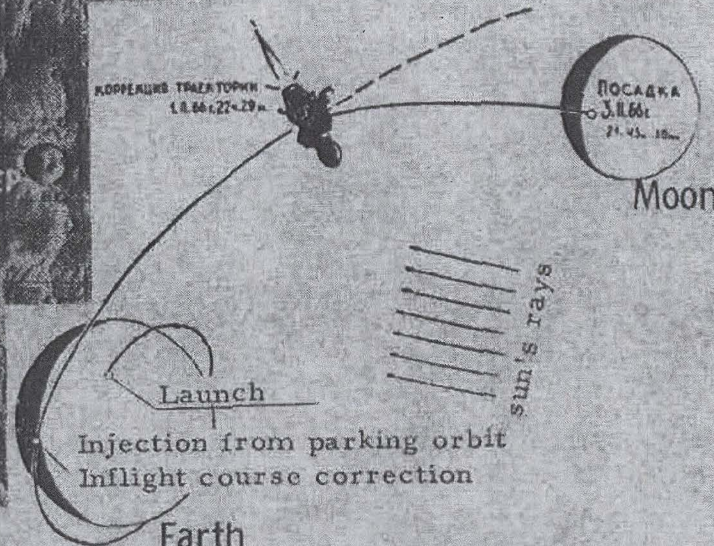
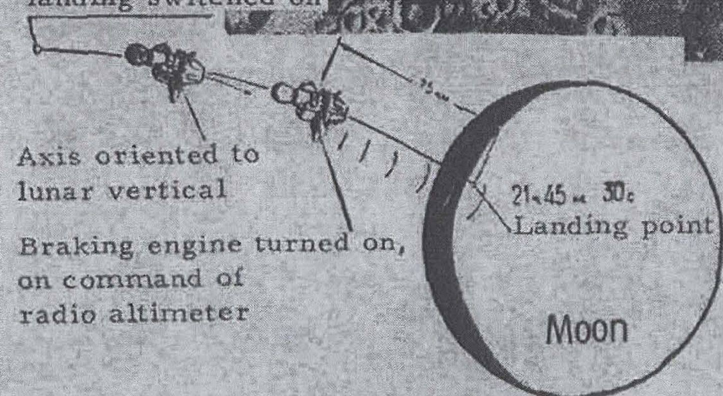
WIR 7/66
18 Feb 66

Where Luna 9 Landed (from Izvestia)





Flight Path of Luna 9



Braking Portion of Flight

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Lunar Panorama in 3 Sections (from Izvestia)

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WIR 7/66
18 Feb 66

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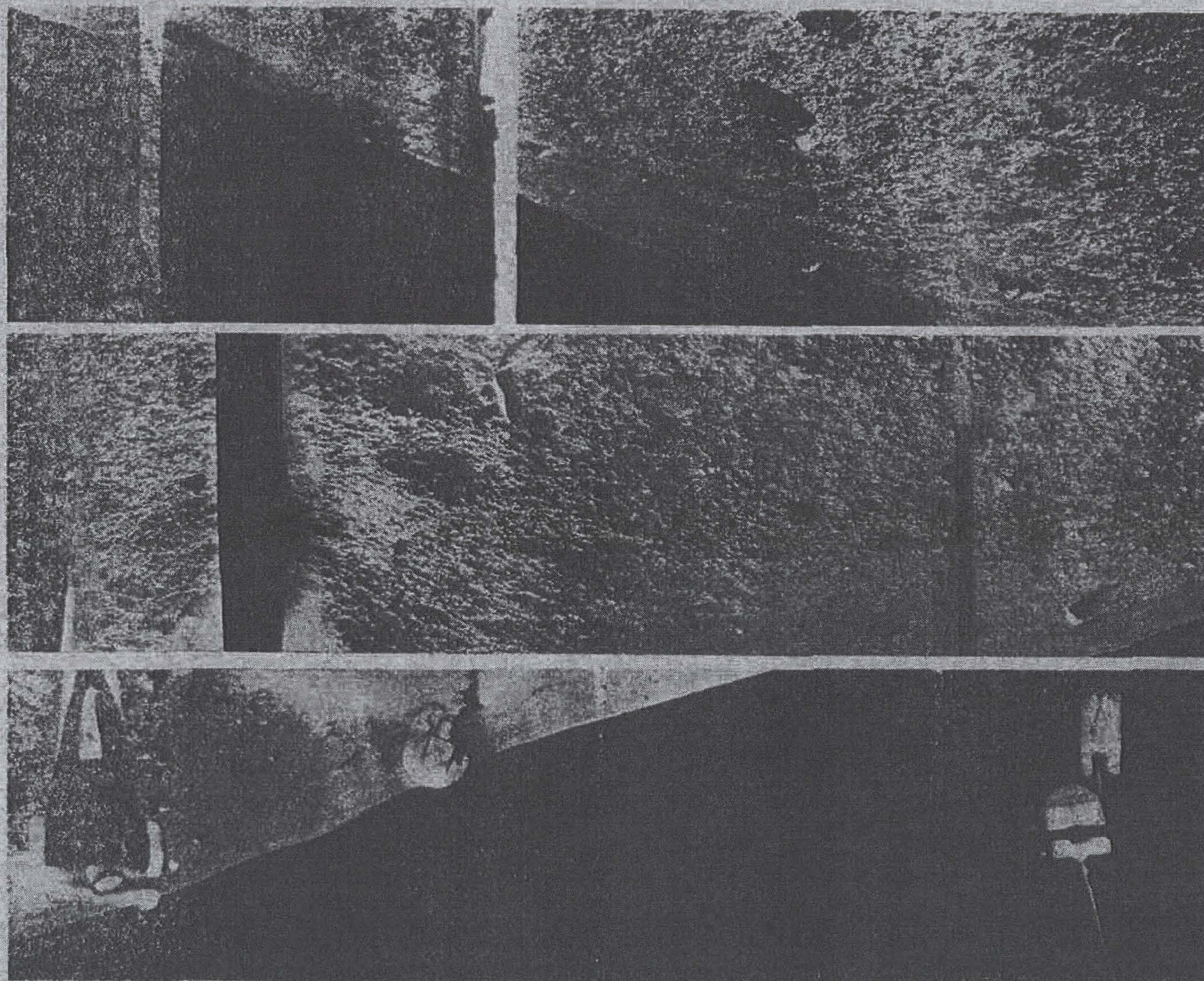

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Soviet Space Vehicles in Orbit

Data as of 1200Z, 11 Feb 66 (except for Cosmos 108)

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Soviet Designation	Object No.	Date of Launch	Inclination to Equator (degrees)	Period (minutes)	Apogee (kilometers)	Perigee (kilometers)	Number of Revolutions
Polyot 1	683	01 Nov 63	58.97	102.2	1382.5	343.4	11727
Electron 1	746	30 Jan 64	60.88	169.2	7113.0	401.1	6321
Electron 2	748	30 Jan 64	58.43	1356.4	66616.9	1807.2	788
Polyot 2	784	12 Apr 64	58.04	90.8	359.3	270.1	10516
Electron 3	829	10 Jul 64	60.91	168.1	7009.8	412.8	4973
Electron 4	830	10 Jul 64	58.97	1313.8	65540.8	1177.4	636
Cosmos 41	869	22 Aug 64	66.70	714.7	39283.2	928.0	1083
Cosmos 44	876	28 Aug 64	65.09	99.5	867.6	604.2	7695
Cosmos 53	983	30 Jan 65	48.70	94.8	798.7	214.7	5608
Cosmos 54	1089	21 Feb 65	56.11	103.6	1597.6	261.8	4904
Cosmos 55	1090	21 Feb 65	56.07	103.6	1591.8	266.8	4896
Cosmos 56	1091	21 Feb 65	56.07	102.6	1498.0	261.5	4938
Cosmos 58	1097	26 Feb 65	65.01	96.8	622.2	587.1	5212
Cosmos 61	1267	15 Mar 65	56.07	103.4	1578.6	262.3	4599
Cosmos 62	1268	15 Mar 65	56.06	103.6	1594.0	265.4	4603
Cosmos 63	1269	15 Mar 65	56.07	102.6	1497.4	264.4	4634
1st Molniya 1	1324	23 Apr 65	65.19	720.5	39706.4	785.7	589
Cosmos 70	1431	02 Jul 65	48.75	96.5	957.2	220.0	3313
Cosmos 71	1441	16 Jul 65	56.05	95.2	543.3	517.9	3181
Cosmos 72	1442	16 Jul 65	56.07	95.9	587.2	537.6	3159
Cosmos 73	1443	16 Jul 65	56.08	95.6	556.3	536.7	3170
Cosmos 74	1444	16 Jul 65	56.05	96.2	614.9	539.6	3149
Cosmos 75	1445	16 Jul 65	56.05	96.5	643.0	540.1	3139
Cosmos 76	1464	23 Jul 65	48.77	90.2	332.2	230.8	3202
Cosmos 80	1570	03 Sep 65	56.10	115.0	1543.7	1364.4	2016
Cosmos 81	1571	03 Sep 65	56.10	115.3	1548.7	1392.6	2009
Cosmos 82	1572	03 Sep 65	56.11	115.7	1557.9	1414.7	2003
Cosmos 83	1573	03 Sep 65	56.11	116.1	1564.6	1442.4	1997
Cosmos 84	1574	03 Sep 65	56.10	116.4	1570.9	1470.1	1990
Cosmos 86	1584	18 Sep 65	56.04	115.1	1634.9	1281.7	1830
Cosmos 87	1585	18 Sep 65	56.07	115.5	1644.7	1308.3	1823
Cosmos 88	1586	18 Sep 65	56.09	115.8	1655.2	1332.1	1817
Cosmos 89	1587	18 Sep 65	56.09	116.2	1670.7	1353.6	1811
Cosmos 90	1588	18 Sep 65	56.09	116.7	1683.0	1378.8	1804
2d Molniya I	1621	15 Oct 65	65.17	716.1	39725.5	557.5	243
Cosmos 97	1777	26 Nov 65	48.43	107.5	2003.0	212.6	1025
Cosmos 100	1843	17 Dec 65	65.00	97.6	656.9	630.1	832
Cosmos 101	1846	21 Dec 65	48.78	92.2	505.7	252.9	815
Cosmos 103	1868	28 Dec 65	56.04	97.0	634.0	595.5	668
Cosmos 106	1949		48.38	92.9	542.2	284.2	263
Cosmos 107	1998	10 Feb 66	65.01	89.8	313.6	216.4	
Cosmos 108	2002	11 Feb 66	48.8	95.09	841.6	214.8	

▌Multiple Launches

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WIR 7/66
18 Feb 66

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