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NORTH AMERICAN AIR DEFENSE COMMAND

WIR

WEEKLY INTELLIGENCE REVIEW (U)

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The WIR in Brief

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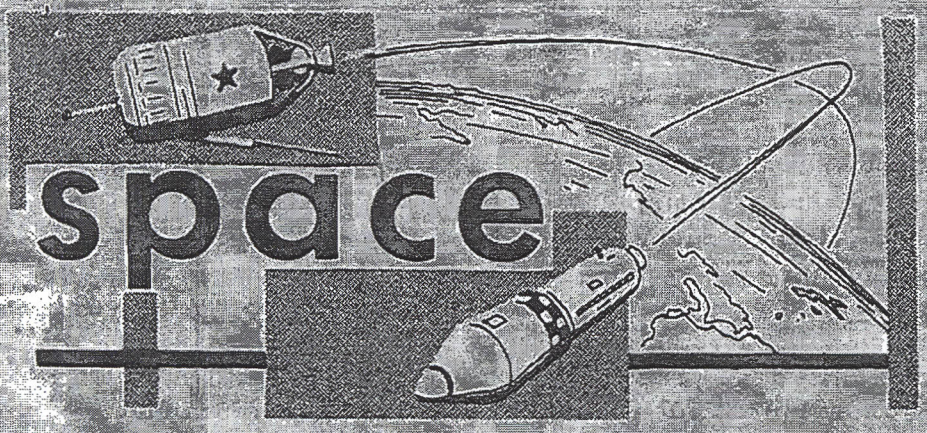
Space

COVER: Scene at Soviet air base. (From Red Star.) (OFFICIAL USE ONLY)

NOTE: Pages 22, 23, 26, and 27 of this issue are blank.



significant intelligence on space developments and trends

Soviet Solar-Flare Predictions Adequate for Near-Earth Orbiting, Not for Lunar Flights

Soviet solar-flare predictions in support of manned-space flight are believed to be about 75 percent accurate for flares of all intensities. Flare intensity can be predicted by the Soviets' method, although the dangerous cosmic-ray flares apparently are easier to predict than smaller flares.

Predictions are not believed to be accurate more than 2 days in advance. This capability is adequate for near-Earth manned space events, allowing the Soviets sufficient time to effect de-orbit should dangerous flares be forecast, but is not adequate for manned lunar missions, which would last approximately a week. The greatest cosmic-radiation danger to manned lunar flight is that of energetic protons generated in large solar flares.

The method which the Soviets are using is an empirical one. It is based on a method of observation not tested or used in the US but is not derived from any new discoveries relating to the physics of solar flares. Predictions are based on observations of solar magnetic field gradients by complex ground-based equipment.

(CIA)

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Mars Probe(s) Expected Soon

The Soviets can be expected to launch one or more probes of the planet Mars during the forthcoming target season for that planet, which opens about 1 November. During this season, the 2 planets will be so situated with respect to each other that launches can be made with minimum expenditure of launch energy. Also during this period, nonminimum energy launches can be made which involve shorter flight times and shorter communications distances. The Soviets, it may be noted in the chart on page 21, have made 2 or 3 probe launch attempts during or following each of the periods when

the "minimum-energy launch window" was "open," since mid-1960. They have made a total of 7 Venus attempts and 5 Mars attempts.

(The US, during the coming target season for Mars, plans to launch 2 Mariner series probes toward that planet.)

None of the Soviet probes has accomplished its mission, although a few of them have enjoyed some limited successes. (See listing on page 24.) In summary, there have been:

- Two failures of third-stage propulsion.
- Seven failures of fourth-stage propulsion.
- Three failures of communications, in one case (Mars 1) compounded by a failure of the orientation system which undoubtedly would have made mid-course guidance impossible had it been tried.

Propulsion. The forthcoming Soviet Mars probe(s) will probably use essentially the same propulsion systems and launch techniques as did its predecessors, more particularly the one reported for Zond 1, which was launched 2 April 1964:

- The SS-6 ICBM booster/sustainer (gross weight: about 500,000 pounds; vacuum thrust: 895,000 pounds) for launch.
- The "heavy" Venik upper stage (gross weight: about 55,700 pounds; vacuum thrust: 65,000 pounds) for injecting the payload and fourth stage into a parking orbit of the Earth.
- A fourth stage (gross weight: about 12,400 pounds; vacuum thrust: 16,600 pounds) for injecting the payload into transfer trajectory toward the target planet.
- A midcourse-guidance engine, incorporated in the payload, for making adjustments of trajectory. Its parameters are not known, but the mid-course-guidance engine on Zond 1 reportedly made a velocity correction of 50 meters per second; this probably represents the approximate maximum capability of the engine.

All engines and staging are believed to use liquid propellants.

Payload. The payload of the forthcoming Mars probe(s) undoubtedly will be heavier and more highly instrumented than the US's Mariner probes.

The Soviets claimed that the payload of Mars 1 weighed 1,965 pounds and that it consisted of 2 sealed compartments, one for collecting data on the space environment while en route to Mars, the other for collecting data on Mars while passing in its vicinity. It was said to include:

- A photo-TV device for photographing the Martian surface.
- A spectro-reflectometer for detecting organic ground cover on Mars.
- A spectrograph for studying the ozone-absorption bands of Mars.

- Magnetometers for measuring magnetic fields in space and for detecting the magnetic field of Mars.
- Gas-discharge and scintillation counters for detecting the radiation belts of Mars and for study of the cosmic-radiation spectrum.
- Counters for sampling the nuclear components of primary cosmic radiation.
- A radiotelescope for studying electromagnetic radiation in space in the 150- and 1500-meter bands.
- Traps for registering streams of low-energy protons and electrons and the concentration of positive ions in space and near Mars.
- Sensors for registering collisions with micrometeorites.

The Soviets' claim was probably true: they have the propulsion capability, and a lie could have placed them in the risky position of having to fabricate data from nonexistent sensors or instrumentation if the probe had performed as planned.

The instrumentation of the forthcoming probe(s) will probably be as great if not greater in quantity, and possibly more sophisticated, than that installed on Mars 1.

Timing and Trajectory. The Soviets appear to launch most of their interplanetary probes late in the minimum-energy launch period, or even well after the optimum period has passed. In some cases, delays in preparations may have been involved, but in other cases the timing may have been deliberate. Propulsion requirements are somewhat heavier late in the period, but the demands on guidance-injection are lighter, and sometimes (but not in 1964) communications requirements are less.

The Soviets may, however, for reasons of propaganda and prestige -- both at home and abroad -- try to launch early in the coming optimum period. The total number of probe attempts to be made cannot be estimated but almost certainly the Soviets are readying at least 2 vehicles for launch.

Optimum launch times, assuming use of the parking-orbit technique, for various dates during the coming target season are given on page 9. One of the possible trajectories (but not the optimum trajectory) for a postulated launch of 30 November, having a flight time of 230 days over a distance of 135.8 million miles, is shown on page 25.

Soviet Announcements. The history of Soviet interplanetary probes to date strongly suggests that Soviet public-information policy on these vehicles will be as follows:

- A failure to launch the payload or to inject it into parking orbit of the Earth will not be admitted.
- A vehicle successfully injected into parking orbit but which fails to be

Minimum-Energy Launches to Mars, 28 October-27 November

Launch Date (1964)	Launch Time (Z)	Time of Flight (days)	Arrival Date (1965)	Launch Date (1964)	Launch Time (Z)	Time of Flight (days)	Arrival Date (1965)
28 Oct	2026	213	29 May	13 Nov	1640	247	18 Jul
29 Oct	2019	214	31 May	14 Nov	1634	246	18 Jul
30 Oct	2015	216	3 Jun	15 Nov	1616	246	19 Jul
31 Oct	2007	217	5 Jun	16 Nov	1612	245	19 Jul
1 Nov	2003	219	8 Jun	17 Nov	1559	245	20 Jul
2 Nov	1954	220	10 Jun	18 Nov	1555	244	20 Jul
3 Nov	1948	222	13 Jun	19 Nov	1551	243	20 Jul
4 Nov	1941	224	16 Jun	20 Nov	1540	243	21 Jul
5 Nov	1933	226	19 Jun	21 Nov	1535	242	21 Jul
6 Nov	1922	227	21 Jun	22 Nov	1525	242	22 Jul
7 Nov	1915	230	25 Jun	23 Nov	1520	241	22 Jul
8 Nov	1903	232	28 Jun	24 Nov	1510	241	23 Jul
9 Nov	1850	234	1 Jul	25 Nov	1505	240	23 Jul
10 Nov	1836	237	5 Jul	26 Nov	1456	240	24 Jul
11 Nov	1820	242	11 Jul	27 Nov	1451	239	24 Jul
12 Nov	1648	248	18 Jul				

- This data should not be construed as a NORAD estimate that the Soviets will launch a Mars probe on any given day or at any given time.
- Other launch times could be chosen for these same dates which, though requiring more energy, would reduce flight times and communications distances.
- ASSUMPTIONS: Probe launched from Tyuratam into parking orbit and injected into transfer trajectory. Injection engine started at point 16 degrees back along parking orbit from injection point.
- Accuracy of launch times believed accurate to within 15 minutes.
- Optimum Launch Dates: 19-20 November.

secret

injected into transfer trajectory probably will be announced as a Cosmos-series vehicle, as was the case with Cosmos 27, a Venus probe launched on 27 March 1964. Such an announcement will meet the launch-reporting requirements established by the UN, but it will be misleading as to the vehicle's true mission.

- A probe successfully launched into a transfer trajectory of any kind will probably be announced initially as a member of the "Zond" ("sound" or "probe") series and as having as its mission the exploration of space. Announcements of various events -- the reception of telemetry and beacon signals and the execution of midcourse-guidance corrections -- will be made as they occur, with possibly some detail given. The probe's celestial coordinates (declination and right ascension) and some velocity data will probably be reported, as they have been in the past. However, the fact that the probe is an interplanetary attempt will not be publicly admitted unless and until it succeeds in reaching its target and transmits data on it to the USSR.

(FTD; SPADATS; NORAD)
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Cosmos 48 Apparently Another Photorecce Mission

Cosmos 48, which the Soviets launched from Tyuratam at about 0959Z, 14 October and de-orbited on 20 October on Revolution 96, is believed to be another photoreconnaissance vehicle, the 11th launched this year. It was launched 12 days after de-orbit of Cosmos 46 -- the last suspected Soviet photorecce vehicle, which, in turn, was launched only 11 days following launch of Cosmos 45, the preceding one of the series.

Reported parameters of Cosmos 48:

	SPADATS	TASS
Inclination to Equator	65.04 degrees	65.097
Period	89.39 minutes	89.4 minutes
Apogee	287.3 km	295 km
	155 n.m.	159 n.m.
Perigee	202.3 km	203 km
	109 n.m.	109.5 n.m.

Telemetry intercepts indicate that the new vehicle was launched by the SS-6 ICBM booster/sustainer and injected into orbit by the "light" Lunik upper stage.

The Cosmos 48 launch adheres to a cycle of launch-vehicle and orbital-parameter combinations established with Cosmos 29, which was launched on 25 April 1964:

	65°-inclination, Lunik upper stage	65°-inclination, Venik upper stage	51°-inclination, Lunik upper stage
Cosmos Nos.	29	30	32
	33	34	35
	37	45	46
	48		

All these vehicles were de-orbited, all were launched from Tyuratam, and all are suspected of photoreconnaissance.

The 65-degree Lunik vehicles have wide-swatch coverage and 10-30 feet resolution, their photography probably being used as a basis for selecting targets for finer resolution (5-8 feet) cameras in the 65-degree Venik vehicles. The 3d member of the series (the 51-degree Luniks) probably gathers massive middle-latitude target photography, since they spend about twice the number of daylight hours over prime photo-recce targets (the US and southern Canada) as the other 2 types of vehicles. This cycle may cease soon, if it has not already done so, since the number of hours of daylight is rapidly decreasing.

The Cosmoses skipped in this tabulation -- Nos. 31, 36, 38, 39, 40, 41, 42, 43, 44, and 47 -- are not believed to have been photoreconnaissance vehicles. None of them was de-orbited, several were not launched from Tyuratam, and the orbital parameters of many were far removed from those of the photorecce series. Generally speaking, most of these exceptions were research or test vehicles, or failures. The missions -- known or suspected -- of most of these vehicles were described in WIR 38/64; Cosmos 47, which was launched later, is believed to have been a rehearsal for the flight of Voskhod 1. (See last week's WIR.)

(SPADATS; NORAD)

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Soviet Interplanetary Probes

Date	Target	Soviet Name	Cause of Failure	Substance of Soviet Announcements
10 Oct 1960	Mars	none	Premature cutoff of 3d stage engine	None
14 Oct 1960	Mars	none	Premature cutoff of 3d stage engine	None
04 Feb 1961	Venus	Heavy Sputnik	Stabilization failed in parking orbit, prior to feasible time for 4th stage ignition	An earth satellite vehicle collecting data on the near-Earth space environment (No telemetry received after injection into parking orbit.)
12 Feb 1961	Venus	Venus 1	Communications failed 11 days after launch	Successful launch of vehicle into transfer trajectory toward Venus. Payload details given.
25 Aug 1962	Venus	none	Tumbling 4th stage produced no useful thrust	None
01 Sep 1962	Venus	none	Tumbling 4th stage produced no useful thrust	None
12 Sep 1962	Venus	none	Partial failure of attitude stabilization	None
24 Oct 1962	Mars	none	Malfunction subsequent to 4th-stage ignition	None
01 Nov 1962	Mars	Mars 1	Communications failed about 5 months after launch; stabilization failed	Successful launch of vehicle toward Mars announced. Payload details given. Soviets announced that stabilization failed.
04 Nov 1962	Mars	none	4th-stage injection failure	None
27 Mar 1964	Venus	Cosmos 27	4th-stage injection failure	Cosmos vehicle launched to collect data on near-Earth space environment.
02 Apr 1964	Venus	Zond 1	Communications failed less than 2 months after launch	Vehicle launched to assist in development of equipment for "distant interplanetary flight."

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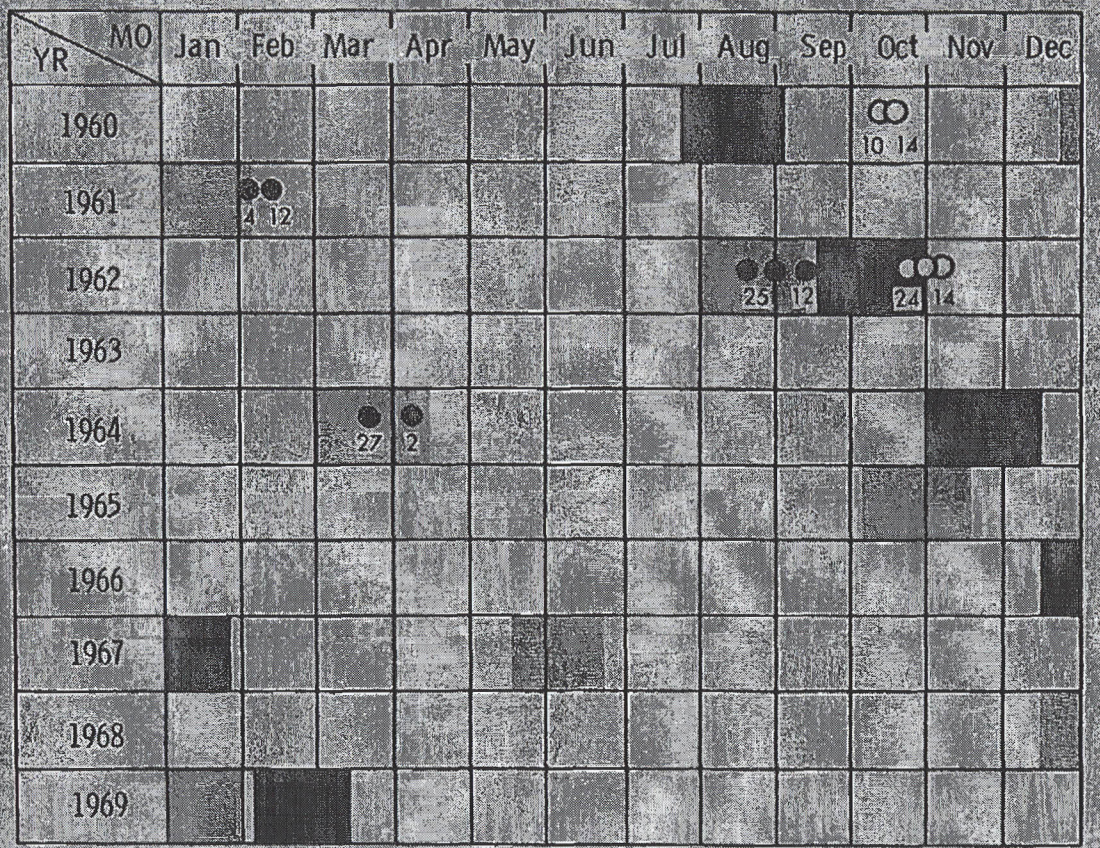
Favorable Periods (minimum-energy launch "windows") for Launches of Mars and Venus Probes, 1960-1969



The Soviets may have planned for 3 instead of 2 Venus launches early this year. The 1962 ~~3~~ launches came in ~~pairs~~; also, the launches of 27 Mar and 2 Apr bracketed the optimum launch date, whereas the average Soviet interplanetary launch comes late in the favorable launch period or follows it.

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WIR 43/64

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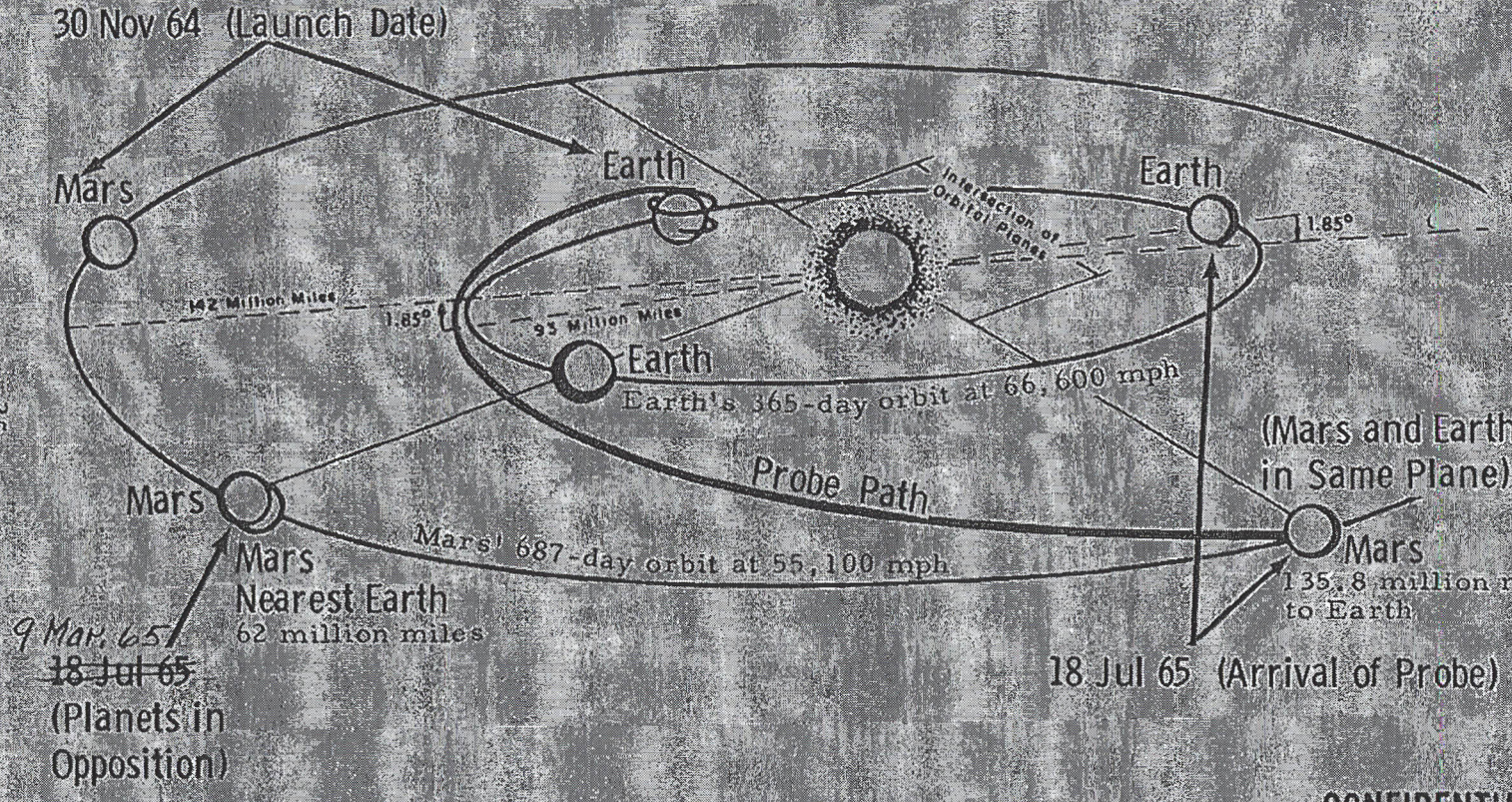
Postulated Trajectory Earth-to-Mars for 30 November Launch



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