(U) CRYPTOLOGIC ALMANAC

(S/N) The Longest Search:
The Story of the Twenty-one-Year Pursuit of the Soviet Deep Space Data Links,
and How It Was Helped by the Search for Extraterrestrial Intelligence

There is a long history in SIGINT collection of searching for particularly important signals
— commonly referred to as "the most wanted." For most of these signals, the search lasted for a few
years. This was because the target signals usually were associated with a well-defined event, such as a
missile launch, and resources already existed in place or could be surged. Also, the search could be
justified on national security grounds. But one signal defied collection for twenty-one years — the Soviet
deep space probe broadband telemetry link that carried scientific and orbital video and radar imaging and
mapping data. The search began in 1962 and eluded the best efforts of SIGINT collection specialists and
signals analysts until 1983. If this search was not quite a Moby Dick-like obsession, it never entirely left
the minds of those analysts who wanted the signal, either. The decades-long search encountered a
number of obstacles that included failed Soviet deep space missions, the loss of intercept sites in Turkey
and Ethiopia, and skeptical intelligence and defense communities that questioned the point of it all.

Notice of this signal first appeared in 1962 with the launch of the first successful Soviet
interplanetary probe known as Mars 1. (Before 1962, seven probes had been launched towards Venus
and Mars. However, only Venus 1 left earth orbit, and two weeks later radio contact was lost.)
Eventually, the Mars 1 probe lost its attitude control, causing the high-gain antenna to lose earth-lock at a
distance of 106 million miles. However, before this accident, the Soviets announced that the satellite
would be communicating on four frequencies — 163, 32, 8, and 5 centimeters (or approximately 183
MHz, 922 MHz, 3.7 GHz, and 5.7 GHz). With the announced telemetry channels identified, over the
next fifteen years, with the help of intercept from sites such as STONEHOUSE in Asmara, Ethiopia, the
exact frequency and data types for the first three links were intercepted and identified. The first two were
tagged as satellite control lunar telemetry and imaging channels. The third was reserved for experiments
involving measurements of occultation (the passage of a celestial body between two others and the
resulting observations) and was not used very often. But it was the fourth frequency, a channel evidently
used for high-rate scientific or imaging data transmission that SIGINT collectors wanted, but could not
find. Over the next decade, Soviet probes to Mars and Venus (Mars 5 in 1973 and Venus 9 and 10 in
1975) successfully traveled to those planets and sent back high-quality pictures and scientific data. The
Soviets had released the pictures and scientific information from these missions to the press. But the
intelligence community remained unable to intercept the data transmissions from satellites.

The problem with intercepting the 5-centimeter broadband signal was a matter of timing
and scale. Soviet mission control was located in the Crimea. Satellite transmissions were of short
duration — only when the station in Crimea could "see" the satellite, though the Soviets could and did

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deploy space craft support ships to augment their coverage. United States field stations were located at the St. Petersburg site. They could intercept transmissions only during the same short windows; the sites were located along the same meridian as the Crimean site. The field station in Astana could intercept the narrow-band transmissions, both uplink and downlink, but even it could not find the 5-centimeter signal. In 1975 the STONEHOUSE mission had withdrawn and, while the Venus 9 and 10 missions were en route to Venus, the sites in Turkey had been closed. The CIA managed a last-minute effort to use a former NASA deep space facility near \( \text{The station was up and searching, but nothing was heard.} \)

\( \text{(S)} \) Another part of the problem negating the intercept of the signal was uncertainty about the exact frequency of the wideband signal. The existence of the signal was not a case of disinformation; there was enough circumstantial evidence from the telemetry in the command links to suggest that scientific information and pictures were being taken. The problem was the immense frequency band that had to be searched—a band somewhere between a half to three-quarters of a Gigahertz. Also, because of distance, the signal from space would be extremely weak. To widen the search bandwidth to find it would let in too much background noise and could bury the desired signal. A narrower search band would preclude ever covering the entire possible frequency range.

\( \text{(S)} \) Other agencies attempted to discover the frequency, or at least narrow the range. CIA hardware specialists visited displays of Soviet satellites at various international space exhibitions. At Paris in 1968 and at Los Angeles in 1977, the Soviets displayed full-scale replicas of satellites used to photograph the Moon and Venus. Experts studied the waveguides that led from the sensor packages to the radio transmitters and discovered that the equipment was configured to transmit a signal somewhere between 5.6 to 6.3 GHz. Also, some Western astronomers who were aware of the search for the missing data signal discreetly queried their Soviet colleagues about the Soviet data link. One was told that it was 5.9 GHz.

\( \text{(S/H)} \) In June 1983 the Soviets launched two new probes to Venus – Venera 15 and 16. The intended mission of both satellites was radar mapping of the surface of Venus—a project that the United States was planning for 1988. If the U.S. intelligence community was to have a chance to collect the deep space data link, it had to hurry. An intercept station was chosen for the attempt, which previously had been used successfully for the collection of moon space signals. This time, though, the analysts had a new asset, a system designed specifically for the collection of signals from deep space. Called a Radio Frequency Interference (RFI) van, it was a unique configuration of receivers, spectrum analyzers, and computers. It included a digital signal analysis subsystem that could monitor 64,000 radio channels, each 205Hz wide simultaneously. However, the RFI van belonged to a research group working for the National Aeronautics and Space Administration (NASA) – the Search for Extraterrestrial Intelligence or SETI.

\( \text{(U)} \) The SETI project had begun in the 1970s as part of the search for radio signals from space that might come from other habitable planets. The program had many critics from all quarters. One year it received the Golden Fleece Award from Senator William Proxmire (D-WI), who was famous for skewering government programs that appeared to waste money. Despite hoots of derision and funding...
In the final analysis, though, there seems to have been few obvious benefits from this prolonged search for the Soviet deep space data link. Obviously the intercept effort was a technical achievement. The SETI RFI van pointed the way to advanced collection and signal analysis systems. There may have been some application to the study of Soviet space communications, especially with its constellation of intelligence satellites that circled the earth. Perhaps, though, just the satisfaction of solving a twenty-one-year mystery was enough for those involved.

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