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PHOTOGRAPHIC
INTERPRETATION
REPORT

NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

ELECTRONICS FACILITIES AT KAPUSTIN YAR SSM RANGE AND VLADIMIROVKA ADVANCED WEAPONS AND RESEARCH COMPLEX USSR

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INSTALLATION OR ACTIVITY NAME					COUNTRY
Electronics Facilities at Kapustin Yar SSM Range and Vladimirovka Advanced Weapons and Research Complex					UR
UTM COORDINATES	GEOGRAPHIC COORDINATES	CATEGORY	BE NUMBER	COMIREX NO.	NIETB NO.
NA	See Below	See Below	See Below	See Below	See Below

MAP REFERENCE

ACIC. US Air Target Charts, Series 200, scale 1:200,000

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	NEGATION DATE (If required)
	NA
	NPIC PROJECT
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INTRODUCTION

This report on range-wide electronics components is based on large-scale photographic coverage which makes possible an analysis of many pieces of electronics equipment not previously identified.* This detailed analysis clarifies the relationships between the launch facilities and near range and downrange electronics facilities, and reveals five basic functional categories of range electronics facilities.

The first major category includes those facilities associated with surface-to-surface missile (SSM) testing. These vary greatly in size, equipment, and location. Their common function is the collection of missile performance data.

The second functional group of facilities is associated with the Vladimirovka Advanced Weapons and Research Complex (VAWARC). These facilities are all located at the rangehead or in the near range area and appear to be similar to some of the SSM-related electronics facilities surrounding them. They are distinguishable from other electronics facilities by their configuration and equipment. The function of these facilities is the collection of ballistic vehicle performance data.

The differences in functions between the SSM and the Vladimirovka Complex-related tracking facilities can be clarified by stating that the SSM-associated facilities record data on the performance of missiles (MRBMs, IRBMs, and orbital launch vehicles) from launch to impact or insertion. The VAWARC-related facilities are used in testing ballistic vehicles (bombs, rockets, tactical air-to-surface missiles, and the warheads and "shapes" relating to these devices) for properties related to the ballistic flight of air-to-surface weapons and the accuracy with which they are delivered.

*The dimensions given in this report are derived from mensuration performed prior to implementation of the NPIC practice of stating dimensions in metric units.

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The third functional group of facilities is the range-associated air warning (AW) air traffic control facilities. There are several of these facilities, and their overall function includes range safety, air traffic control, control of test aircraft, and air warning.

Communications facilities comprise the fourth basic functional category of range electronics facilities. Two major and three minor high frequency/very high frequency (HF/VHF) facilities serve as the basic detected communications medium between the Kapustin Yar rangehead, downrange facilities, and other correspondents, including Moscow. Microwave and VHF antennas located at the rangehead facilities indicate that the HF links to the downrange facilities are at least partially supplemented by one or both of these systems. Unfortunately, coverage in the downrange area has not been of adequate resolution to confirm the existence of these systems.

The fifth and final category of range electronic facilities, those associated with surface-to-air (SAM) missile testing, including SAM range communications, were analyzed in a previous NPIC report.[1] Generally, the SAM range communications system, consisting of microwave and troposcatter facilities, is an internal range system. External SAM range communications traffic would have to be carried by the two major HF communications facilities covered in this report. There is a possibility that external range traffic is also carried over microwave links. A known microwave relay link extends into Volgograd, approximately 50 nautical miles (nm) west of the rangehead. However, microwave towers necessary to connect range microwaves systems into the trunk link in Volgograd have not been detected. Landlines could connect these two systems.

Each of the four functional groups covered in this report is examined separately. However, there is a good deal of overlap of function between individual facilities. For instance, all the downrange tracking facilities have communications links of one type or the other. These communications links are an integral portion of the tracking facility and, where visible, are treated as part of the tracking facility. Also, a number of the Vladimirovka Complex-associated ballistic vehicle tracking facilities in the near range area could provide additional data on SSM launches. There are interferometers, exclusively related to SSM activity, at two ballistic vehicle tracking facilities. Obviously the Vladimirovka Complex facilities were situated in an advantageous locale for SSM data collection and now serve both missile and ballistic vehicle testing.

The facilities analyzed in this report are listed below. The Kapustin Yar/Vladimirovka rangehead, near range and downrange facilities, and impact areas are shown in Figures 1 and 2. A functional description of individual facilities and associated equipment at the Kapustin Yar SSM Range and Vladimirovka Advanced Weapons and Research Complex is given in Table 1.

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Facility	Coordinates
Kapustin Yar Rangehead Tracking Facility	48-39N 045-46E
Kapustin Yar Telemetry/ Tracking Facility	48-37-30N 046-12-05E
Kapustin Yar Range Rate/Tracking Facility	48-38-19N 046-16-44E
Kapustin Yar Instrumentation Facility A-1	48-41-45N 046-15-57E
Kapustin Yar Instrumentation Facility A-2	48-44-59N 046-21-16E
Kapustin Yar Instrumentation Facility A-3	48-36-54N 046-18-41E
Kapustin Yar Instrumentation Facility A-4	48-46-59N 046-28-10E
Kapustin Yar Instrumentation Facility A-5	48-33-25N 046-23-42E
Kapustin Yar Instrumentation Facility A-6	48-41-26N 046-13-58E
Kapustin Yar Instrumentation Facility A-7	48-38-22N 046-14-05E
Kapustin Yar Instrumentation Facility A-8	48-36-21N 046-25-58E
Kapustin Yar Instrumentation Facility H-1	48-50-30N 046-29-30E
Kapustin Yar Instrumentation Facility C-1	48-35-47N 046-15-49E
Kapustin Yar Instrumentation Facility C-2	48-43N 046-24E
Kapustin Yar Instrumentation Facility C-3	48-27-13N 046-23-26E
Kapustin Yar Instrumentation Facility C-4	48-36N 046-32E
Kapustin Yar/Lake Elton Tracking Facility	49-09-33N 046-51-44E

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Facility	Coordinates
Kapustin Yar/ Verkhniy Baskunchak Tracking Facility	48-11N 046-42E
Kapustin Yar/ Shungay Tracking Facility	48-33-20N 046-47-45E
Kapustin Yar/Turgay Tracking Facility	48-18-15N 046-56-30E
Kapustin Yar/ Terekty Tracking Facility	48-10N 048-36E
Kapustin Yar/ Novaya Kazanka Tracking Facility	48-59N 049-33E
Kapustin Yar/Auzy Kuduk Tracking Facility	48-40N 049-26E
Kapustin Yar/ Taskuduk Tracking Facility	48-43N 050-12E
Kapustin Yar/Makat Tracking Facility	47-55N 053-43E
Emba Tracking Facility 4	48-27-54N 057-43-23E
Emba Tracking Facility 5	48-11-31N 058-16-05E
Sary Shagan Tracking Facility 4A	46-02-30N 072-07-20E
Sary Shagan Communications Facility 3 (HF)	46-01-50N 072-07-22E
Kapustin Yar Instrumentation Facility D-1	48-27-04N 046-15-48E
Kapustin Yar Instrumentation Facility D-2	48-28-19N 046-13-55E
Kapustin Yar Instrumentation Facility D-3	48-28-54N 046-08-59E
Kapustin Yar Instrumentation Facility D-4	48-32-09N 046-09-52E
Kapustin Yar Instrumentation Facility D-6	48-26-45N 046-17-45E
Kapustin Yar Instrumentation Facility D-7	48-31-03N 046-17-51E
Kapustin Yar Instrumentation Facility L-1	48-33-16N 046-48-56E

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Facility	Coordinates
Kapustin Yar Instrumentation Facility L-2	48-21-20N 046-48-32E
Kapustin Yar Instrumentation Facility L-2A	48-21-00N 046-54-00E
Kapustin Yar Instrumentation Facility L-2B	48-21-05N 046-58-40E
Kapustin Yar Instrumentation Facility L-3	48-21-06N 047-04-41E
Kapustin Yar Instrumentation Facility L-4	48-20-58N 047-12-49E
Kapustin Yar AW Radar Facility G-1	48-25-02N 046-14-45E
Kapustin Yar AW Radar Facility G-2	48-24-07N 046-14-15E
Kapustin Yar Air Traffic Control Facility G-3	48-26-15N 046-26-15E
Kapustin Yar Airfield Air Warning Radar Facility	48-39-30N 045-42-45E
Akhtubinsk/ Vladimirovka Air Warning Radar Facility 1	48-19-00N 046-13-00E
Akhtubinsk Air Traffic Control Facility, Operations Area A	48-17-10N 046-11-00E
Akhtubinsk Air Traffic Control Facility, Operations Area B	48-17-20N 046-12-40E
Kapustin Yar Communications Facility 1 (HF Transmitting)	48-36-30N 046-12-15E
Kapustin Yar Communications Facility 2 (HF Receiving)	48-36-40N 045-58-30E
Kapustin Yar HF Communi-cations Facility D-5	48-26-30N 046-12-45E
Akhtubinsk Communications Facility	48-18-10N 046-10-15E

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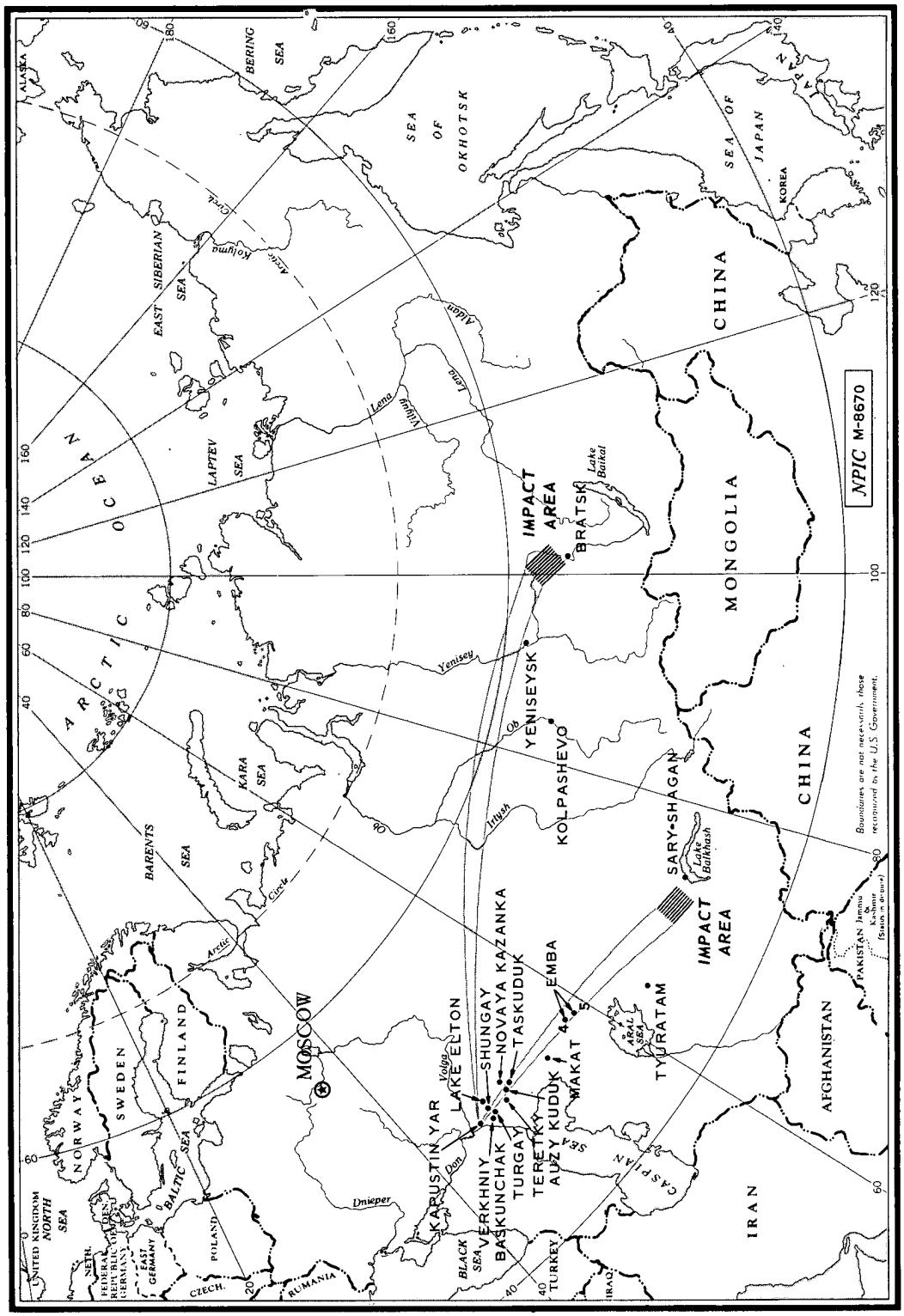

FIGURE 1. KAPUSTIN YAR/VLADIMIROVKA DOWNRANGE AND IMPACT AREAS

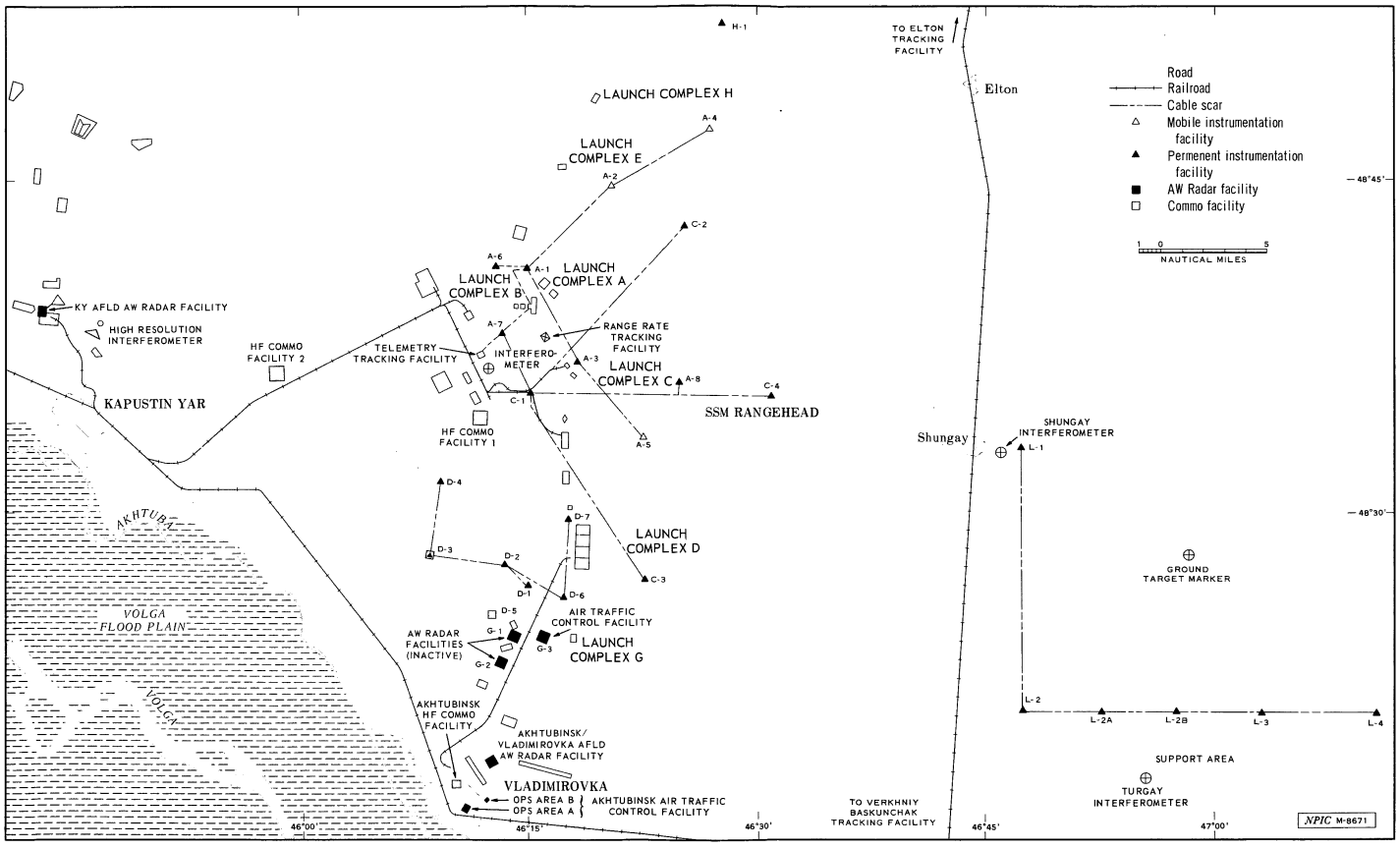

FIGURE 2. KAPUSTIN YAR/VLADIMIROVKA RANGEHEAD AND NEAR RANGE FACILITIES

Table 1. Description of Facilities at Kapustin Yar SSM Range and Vladimirovka Advanced Weapons and Research Complex

FACILITY	FUNCTION	EQUIPMENT
Kapustin Yar Rangehead Tracking Facility	SSM--electronics tracking	High-resolution interferometer
Kapustin Yar Telemetry/Tracking Facility	SSM--optical and electronics tracking, and telemetry collection	1st generation interferometer, telemetry antennas, 1 cinetheodolite, other optical equipment, 2 SHIP WHEEL radars, microwave antennas, HF antennas.
Kapustin Yar Range Rate/Tracking Facility	SSM--collection of range/rate data	Doppler shift measuring antenna
Kapustin Yar Instrumentation Facility A-1	SSM--optical tracking	No apparent equipment
Kapustin Yar Instrumentation Facility A-2	SSM--optical tracking	No permanent structure, no equipment
Kapustin Yar Instrumentation Facility A-3	SSM--optical tracking	No apparent equipment.
Kapustin Yar Instrumentation Facility A-4	SSM--optical tracking	No permanent structure, no equipment
Kapustin Yar Instrumentation Facility A-5	SSM--optical tracking	No permanent structure, no apparent equipment
Kapustin Yar Instrumentation Facility A-6	SSM--optical tracking	2 pedestal-mounted cylindrical optical device shelters
Kapustin Yar Instrumentation Facility A-7	SSM--optical tracking	2 pedestal-mounted cylindrical optical device shelters
Kapustin Yar Instrumentation Facility A-8	SSM--optical tracking	2 pedestal-mounted cylindrical optical device shelters
Kapustin Yar Instrumentation Facility H-1	SSM--optical tracking	2 cylindrical optical device shelters
Kapustin Yar Instrumentation Facility C-1	SSM--optical tracking and communications	2 cylindrical optical device shelters, 2 VHF antennas
Kapustin Yar Instrumentation Facility C-2	SSM--optical tracking	2 cylindrical optical device shelters
Kapustin Yar Instrumentation Facility C-3	SSM--optical tracking	2 cylindrical optical device shelters
Kapustin Yar Instrumentation Facility C-4	SSM--optical tracking	2 cylindrical optical device shelters
Kapustin Yar/Lake Elton Tracking Facility	SSM--optical and electronic tracking	1 SHIP WHEEL radar, 1 cinetheodolite, and a 1st generation interferometer
Kapustin Yar/Verkhniy Baskunchak Tracking Facility	SSM--optical and electronic tracking	1 SHIP WHEEL radar, 2 cinetheodolites, and a 1st generation interferometer
Kapustin Yar/Shungay Tracking Facility	SSM--electronic tracking	2nd generation interferometer
Kapustin Yar/Turgay Tracking Facility	SSM--electronic tracking	2nd generation interferometer
Kapustin Yar/Terekty Tracking Facility	SSM--optical and electronic tracking	1 SHIP WHEEL, 2 BAR LOCK radars, 1 cinetheodolite, 1 cylindrical optical device shelter, HF communications antennas, numerous vehicles, and a 2nd generation interferometer ucon.
Kapustin Yar/Novaya Kazanka Tracking Facility	SSM--optical and electronic tracking and telemetry collection	2 SHIP WHEEL radars, 1 cinetheodolite, HF communications and telemetry antennas, and numerous vehicles
Kapustin Yar/Auzy Kuduk Tracking Facility	SSM-electronic tracking	1 SHIP WHEEL radar
Kapustin Yar/Taskuduk Tracking Facility	--	No apparent equipment

Table 1 (Con't)

FACILITY	FUNCTION	EQUIPMENT
Kapustin Yar/Makat Tracking Facility	SSM--electronic and optical tracking	3 SHIP WHEEL, 1 BAR LOCK, 1 STONE CAKE, and 2 cylindrical optical device shelters, a 1st generation interferometer, and a 2nd generation interferometer ucon.
Emba Tracking Facility 4	Electronic tracking	2nd-generation interferometer ucon
Emba Tracking Facility 5	Electronic tracking	2nd-generation interferometer ucon
Sary-Shagan Tracking Facility 4A	SSM--electronic tracking	3 SHIP WHEEL radars
Sary-Shagan Communications Facility 3	HF communications receiving	2 fishbone antennas
Kapustin Yar Instrumentation Facility D-1	ASM--bombing range support base	1 SHIP WHEEL radar and several vehicles
Kapustin Yar Instrumentation Facility D-2	ASM--impact recording	Small undet instrumentation platform with mounted equipment
Kapustin Yar Instrumentation Facility D-3	ASM--impact recording and ground control communications	Small undet instrumentation platform with mounted equipment and communications antennas
Kapustin Yar Instrumentation Facility D-4	ASM--impact recording	Small undet instrumentation platform with mounted equipment
Kapustin Yar Instrumentation Facility D-6	SSM and ASM--optical and electronic tracking	Cylindrical optical device shelter and a SHIP WHEEL radar
Kapustin Yar Instrumentation Facility D-7	SSM and ASM--optical tracking	Cylindrical optical device shelter
Kapustin Yar Instrumentation Facility L-1	ASM--ballistic object data collection	3 cinetheodolite, 1 SHIP WHEEL radar, 1 prob optical device
Kapustin Yar Instrumentation Facility L-2	ASM--ballistic object data collection	3 cinetheodolites, 1 SHIP WHEEL radar, 1 prob optical device
Kapustin Yar Instrumentation Facility L-2A	ASM--ballistic object data collection	1 SHIP WHEEL radar, 1 prob optical device, 1 UI optical device
Kapustin Yar Instrumentation Facility L-2B	ASM--ballistic object data collection	1 SHIP WHEEL radar, 1 prob optical device
Kapustin Yar Instrumentation Facility L-3	ASM--ballistic object data collection	2 cinetheodolites, 1 UI optical device, 1 SHIP WHEEL radar, 1 prob optical device
Kapustin Yar Instrumentation Facility L-4	ASM--ballistic object data collection	Undet equipment
Kapustin Yar AW Radar Facility G-1	Apparently inactive air warning facility	Unoccupied
Kapustin Yar AW Radar Facility G-2	Apparently inactive air warning facility	Unoccupied
Kapustin Yar Air Traffic Control Facility G-3	Air traffic control	1 BIG BAR radar
Kapustin Yar Airfield Air Warning Radar Facility	Air warning	2 BACK NET, 1 prob SIDE NET (prior 5/67), 1 SQUAT EYE, 1 BAR LOCK, and 1 ROCK CAKE/STONE CAKE radars, and 1 mobile TALL KING radar (after 5/67)

Table 1 (Con't)

FACILITY	FUNCTION	EQUIPMENT
Akhtubinsk/Vladimirovka Air Warning Radar Facility 1	Air warning	2 BACK NET, 2 SIDE NET, 5 BAR LOCK, 2 ROCK CAKE/ STONE CAKE, and 1 SQUAT EYE radars
Akhtubinsk Air Traffic Control Facility Operations Area A	Air traffic control	2 BAR LOCK and 2 ROCK CAKE/ STONE CAKE radars (prior to Aug 69, after Aug 69 - no equipment)
Akhtubinsk Air Traffic Control Facility Operations Area B	Air traffic control	1 BAR LOCK radar (prior to 8/69, after 8/69 - no equipment)
Kapustin Yar Communications Facility 1 (HF Transmitter)	Communications	HF transmitting rhombic, dipole, and prob VHF antennas
Kapustin Yar Communications Facility 2 (HF Receiver)	Communications	HF receiving antennas and fishbone antennas
Kapustin Yar HF Communications Facility D-5	Communications	VHF and HF antennas, dipoles, and fishbone antennas
Akhtubinsk Communications Facility	Communications	Probable UHF/VHF antennas

BASIC DESCRIPTION

Kapustin Yar SSM Instrumentation

A large amount of instrumentation is necessary to support major multisystems SSM testing programs such as those conducted at Kapustin Yar. The numerous instrumentation facilities associated with SSM testing are divided into three groups: first, the major electronics facilities at the rangehead, which collect data on all missile firings; second, the small launch-complex-associated instrumentation facilities; and third, downrange facilities, which record data on all missile flights within their electronic and optical horizons.

Major Rangehead Tracking Facilities

Kapustin Yar Rangehead Tracking Facility. The facility (Figure 3) is located 4 nm north of Kapustin Yar and just north of the former rocket launch complex. This facility is the westernmost electronics facility associated with SSM activity and contains a high-resolution interferometer, a phase measuring device. This type of instrument is also present at the Tyuratam and Plesetsk missile test centers. In each location it is at or near the base support complex and at a considerable distance from the launch complexes. At Kapustin Yar, the high-resolution interferometer is over 20

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nm west and to the rear of the closest launch complex. An additional indication of the probable purpose of the instrument is that the three locations where high-resolution interferometers have been observed are at the three centers of space launching activity in the Soviet Union.

The apparent complexity of the instrument suggests that it is capable of space positioning techniques in addition to phase measuring, such as Doppler shift measurement. This is a common practice which is used in some US tracking instruments. Determination of the technique used by this system would be greatly aided if the exact configuration of the antenna structures mounted atop eight of the nine antenna buildings could be positively identified. These antennas are pedestal mounted, and are probably single dishes. Their pedestal mounts indicate these antennas are pointed at the target, an unnecessary function for a simple phase measuring device.

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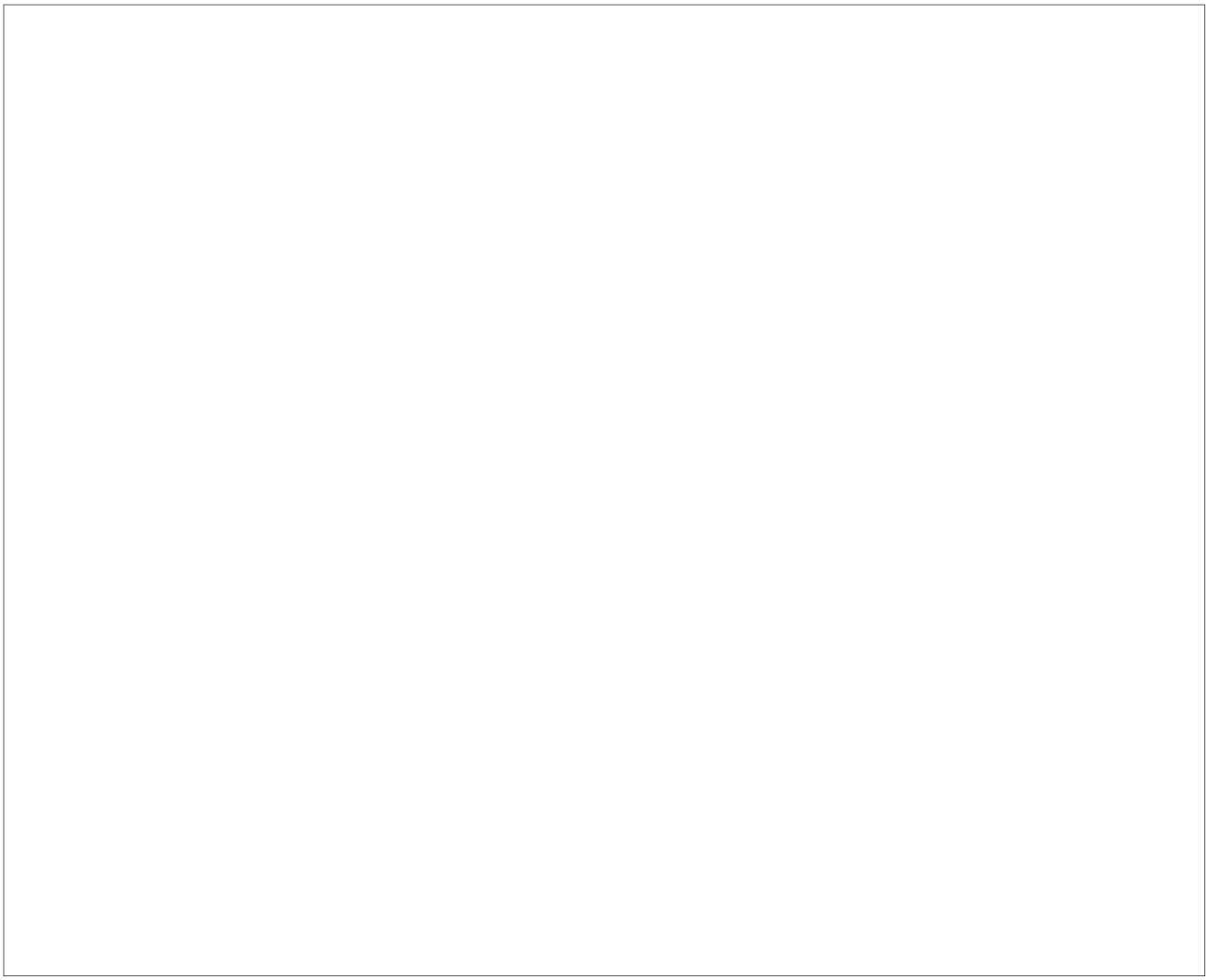

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Regardless of specific techniques used, the capacity of the high-resolution interferometer probably exceeds that of a standard Soviet interferometer. In contrast to the high-resolution interferometer, the standard Soviet interferometer achieves a directed line segment or line of sight by a phase comparison technique. In order to establish the target at a point in space, two of these instruments must be paired and tracking the target at the same time. Using dual techniques, the high-resolution interferometer can probably place a target at a point in space by itself. A previously published report provides detailed mensural data and a comparison of the device at its three locations.[2]

Kapustin Yar Telemetry/Tracking Facility. The facility is located 4 nm west of Kapustin Yar launch complex C, site 1-C (Figure 4). The major telemetry antennas at the rangehead are located here. This equipment monitors, tracks, and collects data from all instrumented launch vehicles fired from the range. Its position, slightly north and to the rear of launch complex C, is equidistant from the ends of the row of launch complexes.

Equipment present at the Kapustin Yar telemetry/tracking facility includes a first-generation, 390-foot baseline interferometer (oriented 0/180 and 90/270 degrees); a cinetheodolite (formerly radar A); two SHIP WHEEL radars (one van mounted in radar C configuration and one building mounted); a Type I five-element helical array; two Type II five-element helical arrays; a roof-mounted four-element helical array; and four unidentified roof-mounted telemetry antennas. This equipment has been present at the facility since January 1965. In mid-1967 an expansion of the facility was initiated. Presently, two new support buildings, an operations support building, and a new heating or powerplant have been completed. Work continues on a new telemetry control building near completion, and also in the vicinity of a newly constructed concrete hardstand of an undetermined purpose in the rear of the facility. Two possible pedestal foundations are under construction adjacent to the new telemetry control building.

Communications equipment at the telemetry/tracking facility consists of two masts of undetermined frequency and configuration located at the north end of the secured area, a small and a large tower near the southern end of the secured area mounting microwave antennas, and a self-supporting lattice tower at the southern edge of the secured area mounting undetermined equipment. Resolution and interpretability of the coverage are not adequate to obtain azimuths on the microwave antennas.

Kapustin Yar Range Rate Tracking Facility. The facility (Figure 5) is a square, secured area located 1.7 nm north-northwest of launch complex C, site 1-C, and 3.2 nm northeast of the Kapustin Yar telemetry/tracking facility. There are two pads in each corner of the security fence and similar pads in the center of the square. These

pads are occupied by an electronics van and a mobile antenna in each area. Cable connects the four corner antennas to the central antenna and its associated vans. The central position has two additional vans. The basic configuration is crossed baselines 2,300 feet in length with orientations of 05/185 and 95/275 degrees.

The device can be identified as a range rate or Doppler shift measuring device for the following reasons: its mobile antennas cannot be placed with the positioned accuracy necessary for an interferometer; there are no ambiguity resolving antennas; the entire site has not been extensively leveled and prepared, which is necessary for an interferometer site; there is no resemblance to known phase measuring systems, and it is very similar to known Doppler measuring systems. Earlier coverage (April 1969) has revealed the presence of two cylindrical optical device shelters located in the vicinity of the central antenna pads. These devices appeared operational. The mobile antennas and their associated vans were not present.

The operations-support area is located immediately southwest of the central antenna and contains eight structures and several vehicles. Rectified plots of the Kapustin Yar telemetry/tracking facility and the range rate tracking facility are available in a previously published report.[3]

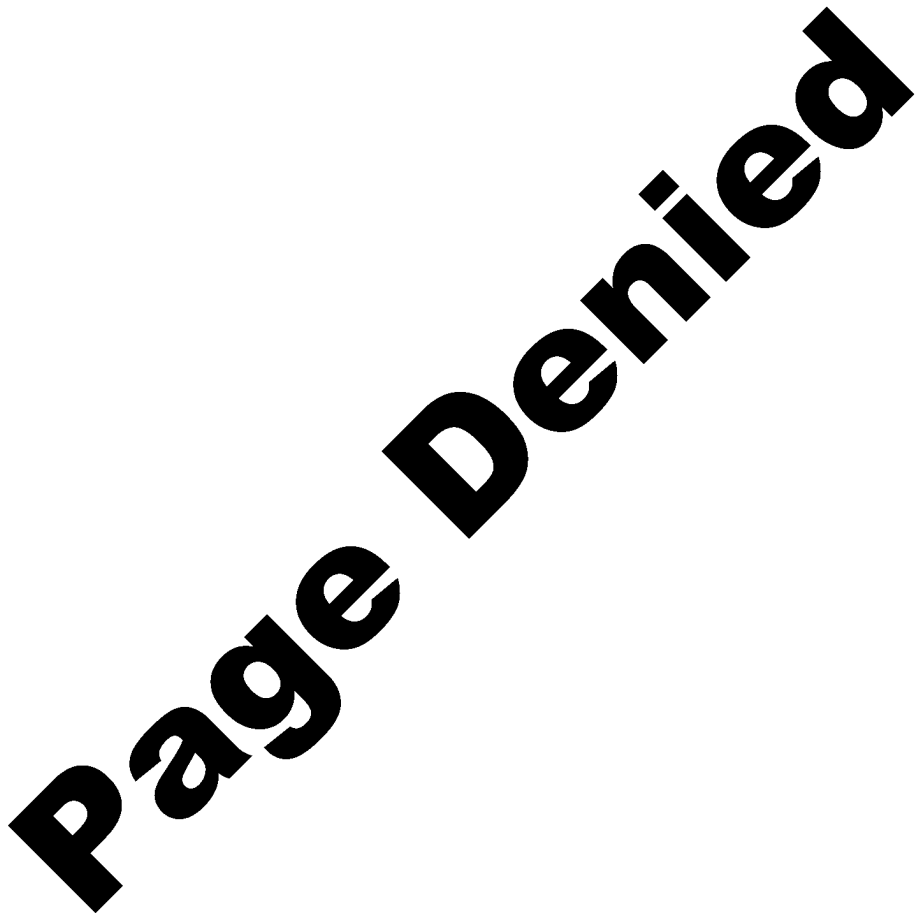
Launch Complex Associated Instrumentation Facilities

In addition to the major rangehead facilities that are collecting telemetry and tracking data, instrumentation is positioned immediately downrange of the launch areas (Figure 2). There are two main groups of facilities associated with launch complexes A and C. These two groups, aided by several additional facilities positioned to fill gaps in coverage, provide complete optical coverage of launches from all active complexes along the launch row.

Optical instruments are probably the primary equipment found at these facilities. The facilities are small. Most of them consist of a cleared area containing a 22-foot square two-story building with an instrument deck on the roof and other small pieces of equipment. They are usually enclosed by a firebreak.

Some of these sites have been downgraded in importance, the permanent structures have been removed, and the areas are being used for placement of van-mounted instrumentation, if any at all. Figure 2 shows permanent and mobile instrumentation positions.

Complex A Instrumentation Group. This group consists of eight facilities, five in front of the launch complexes, and three to the rear. Until late 1968 the instrumentation group consisted of six facilities, A-1 through A-6. At three of these facilities, A-2, A-4, and A-5, the permanent buildings have been removed, and at a



fourth, A-3, the site appears abandoned. The remaining two original facilities, A-1 and A-6, both located behind the launch complexes, appear active. A-1, located in the launch complex A support area, consists of only one building, structure with a raised center section. This building is a standard range instrumentation building, with an instrument deck on the roof of the raised central section.

A-6, located 1.5 nm west of A-1, consisted until the fall of 1968 of a two-story instrumentation building, two ground-mounted cylindrical optical device shelters, four sheds, and several small pieces of undetermined equipment. At that time, construction was observed at A-6 (Figure 6) and two other locations (A-7 and A-8). At A-6 a control building, two pedestals, a small bunker, approximately five support structures, and a new security fence were added to the facility. A-7, located 3 nm south of A-6 and 3 nm southwest of launch complex A, contains new buildings, pedestals, and fence identical to those added to A-6. A-8, located 7 nm east of C-1 instrumentation facility and 7.8 nm southeast of launch complex A, consists of the same structures plus a building. This large additional building may be a support structure necessary because the facility is in front of the launch complexes and remote from other support, or it may indicate additional instrumentation.

As the three facilities neared completion in August 1969, the type of equipment mounted on the pedestals could be determined. At A-6, the removal of the two ground-mounted cylindrical optical device shelters from their positions coincided with the placement of two identical shelters atop the pedestals. Similar shelters were emplaced at A-7 and A-8 during the same time period.

The construction at A-6, A-7, and A-8 began concurrently with modification activity at launch complexes A and B. A plot showing the optimum optical look-angle of each facility (determined by plotting a line perpendicular to a line connecting the two pedestals) reveals that A-6 and A-7 look at the rear of launch complexes A and B from the northwest and southwest respectively, while A-8 looks at the flight path of missiles, immediately after launch from either launch complex A or B. The three facilities can also be associated with launch complex A and B operations by their cable connections. New cable was laid connecting A-7 to A-1 through launch complex B, A-7 to the telemetry/tracking facility, and A-7 to A-8 through instrumentation facility C-1. A-6, being a part of the original system, was already connected by cable to A-1. Finally, the new activity at launch complexes A and B made necessary the update of the A instrumentation group, which had been allowed to deteriorate (see A-2, A-3, A-4, and A-5) during the period of low R&D activity at these launch complexes.

An additional instrumentation facility has been designated H-1 (Figure 7), and is located 4.5 nm north of the unoccupied instrumentation facility A-4. When last observed photography, facility H-1 consisted of a standard two-story building with an open cylindrical optical device shelter on the instrument deck, and an additional, cable-connected cylindrical optical device shelter located on the southern side. Other objects include at least three sheds, a power generator shed connected by cable to the main building, three vans, and two undetermined objects. The activity at this instrumentation facility is significant in that the nearest adjacent instrumentation facilities have not been maintained. Positioning of the facility may associate it with launch complex H, but it is more likely that it is a primary data collection unit on any launch fired in a more northeastern azimuth, for instance, an SS-5 launched for impact in the Bratsk impact area. This vehicle would pass close to overhead instrumentation facility C-2, thus perhaps limiting its ability to track. Facility H-1 is sufficiently north not to be hindered by this difficulty.

Complex C Instrumentation Group. The C instrumentation group consists of four facilities, three of which are located in front of the launch area, with facility C-1 located on the complex access road, 2 nm west of launch site C-2. Each of the C-associated facilities contains one two-story building with a cylindrical optical device shelter on the instrument deck. The forward facilities each have an additional ground-mounded cylindrical optical device shelter, a power generator shed, several additional sheds, vans, vehicles, and some undetermined equipment. Downrange units of the C group are very similar to H-1. It is probable that C-4, which would be directly in the path of an eastern launch, is teamed with H-1 for adequate optical coverage on a northeastern launch.

C-1 is the largest of the instrument facilities serving the launch complexes (Figure 8). There are two, two-story buildings with an instrumentation/observation deck adjacent to the previously mentioned building. The southernmost of these two additional buildings has a cylindrical optical device shelter on the instrument deck. No other instrumentation is visible; however, a hard-surfaced pad, probably for mobile equipment, is located east of the three-instrument buildings. Two probable FORK REST-type VHF antennas are east of, and connected by cable to, the northernmost building. A cable trench from the new A-7 instrumentation facility extends into C-1, traverses the facility, and continues east past launch complex C to A-8 instrumentation facility. Supporting elements of C-1 instrumentation facility consist of eight buildings, two POL tanks in a motor pool area, and numerous vans and vehicles. A rectified plot of C-1 is available in a previously published report.[4]

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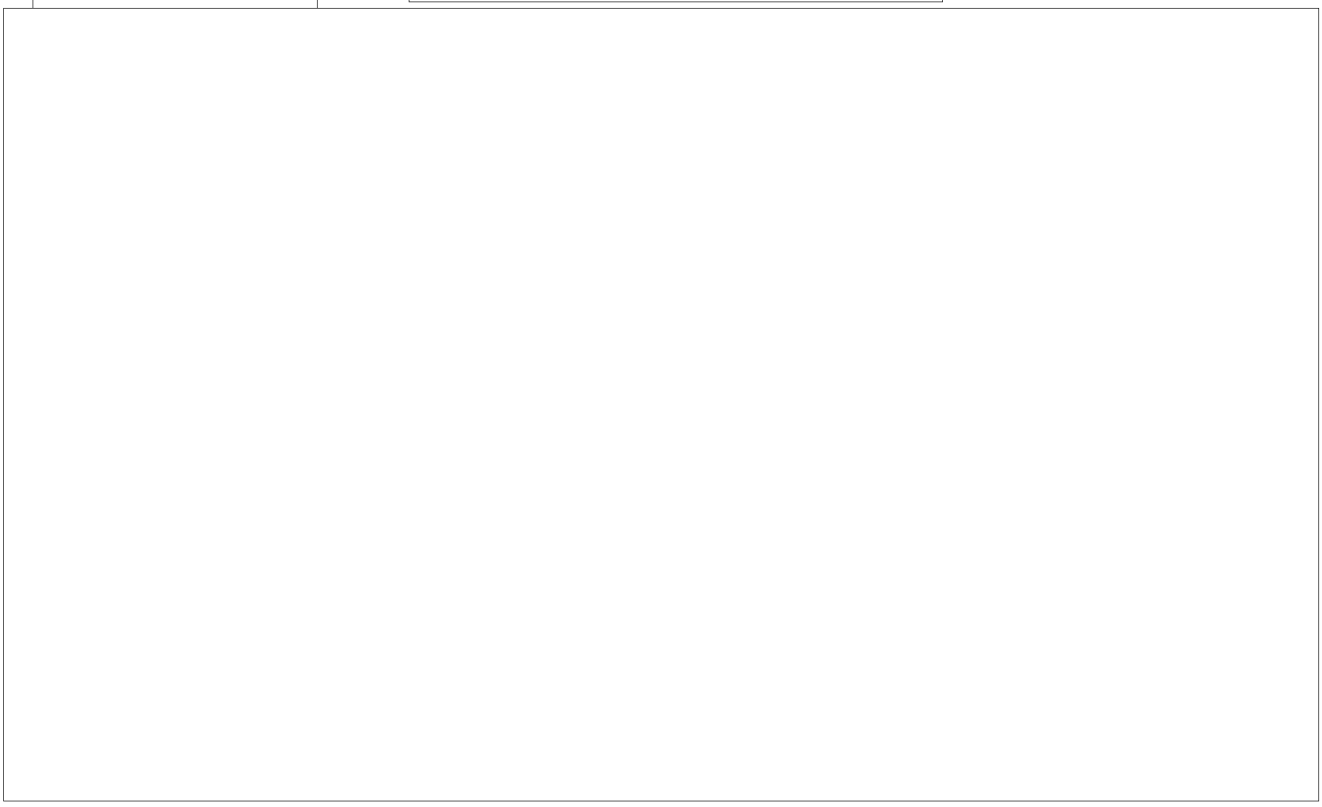

Other Instrumentation Groups. Additional instrumentation facilities of the D group (D-6 and D-7) are located north and south and slightly west of complex D. These two facilities, which closely resemble the C group facilities, probably collect data on launch complex D firings. They are connected by cable scars to air-to-surface (ASM) missile/bombing range instrumentation facilities, 5 nm west of complex D and will be described with this group of facilities. It is also possible that these two facilities serve a dual function.

Downrange Tracking Facilities

Kapustin Yar SSM range extends in two directions (Figure 1). The primary launch direction is east and the range extends to the 1,050 nm impact area at Sary Shagan. A secondary, northeast launch direction is used when testing missiles impacting in the 2,000 nm impact area near Bratsk.

A search of suspected areas in the secondary downrange area has revealed no tracking facilities between the Kapustin Yar facilities, approximately 25 nm east of the launch area, and the Bratsk impact area. This is logical because the launch vehicles reach burnout, and are inserted into their final ballistic trajectory toward Bratsk while still above the electronics horizons of the rangehead area facilities.

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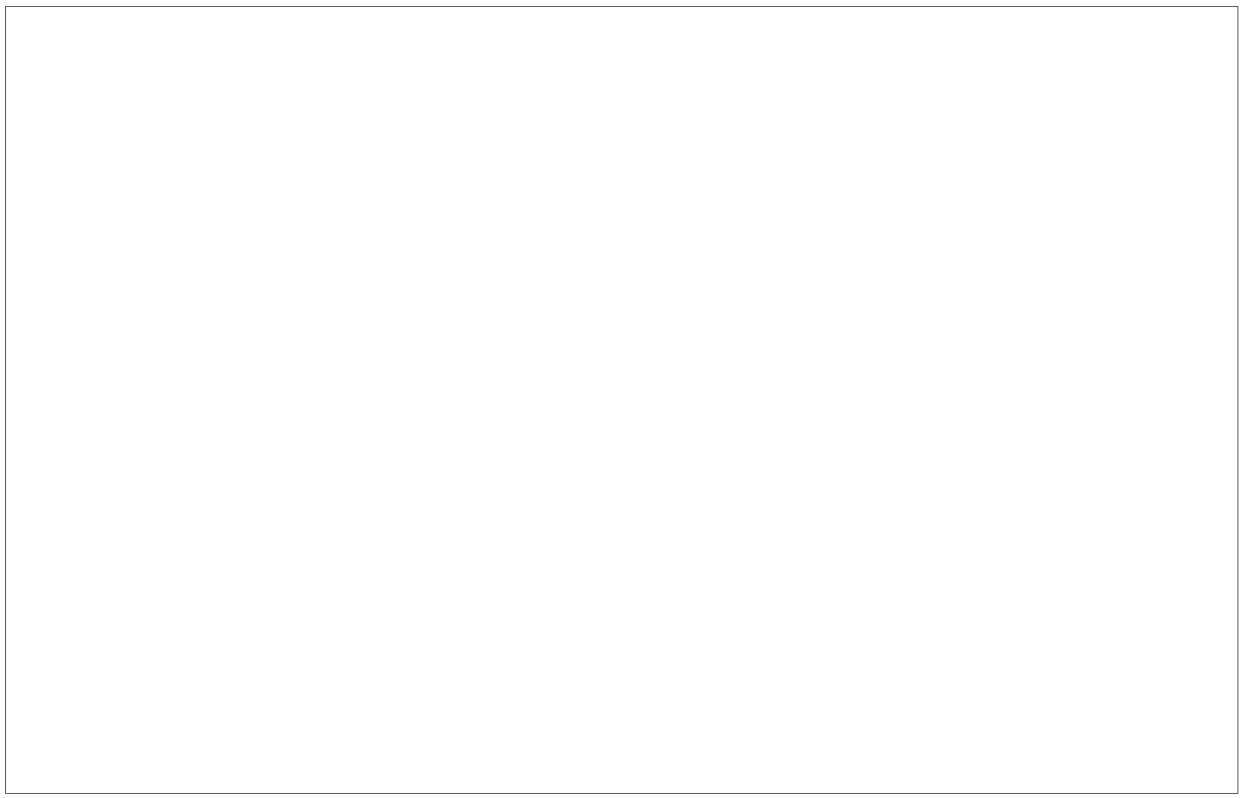

Therefore, there is no primary need for tracking facilities until reaching the impact area. A great circle route from Kapustin Yar to Bratsk passes within range of both Kalpashevo and Yeniseyek earth satellite vehicle tracking facilities, and these facilities could monitor telemetry and track vehicles.

A number of locations around the Bratsk impact area were searched for the impact tracking facilities. While several unusual facilities were located, none of these contained equipment to identify them as tracking facilities.

The primary range, extending to Sary Shagan, has a number of downrange tracking facilities. The first group of four facilities is located approximately 25 nm east of rangehead and has interferometers to track vehicles fired in both primary and secondary range azimuths. Facilities further downrange are located opposite impact and downrange launch areas and are probably primarily concerned with impacts into and launches out of these various areas. This does not preclude these facilities from collecting telemetry and tracking data on ballistic or cruise missiles launched for impact far downrange. Equipment and size of each facility varies and aids in interpreting the function of the facility on the range.

A fact of considerable interest is that a great circle route from Kapustin Yar to Sary Shagan passes through the tracking patterns of both Emba and Tyuratam

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missile test centers. Identification of certain equipment indicates the probability of dual range usage at some of these facilities.

Lake Elton and Verkhniy Baskunchak Tracking Facilities. These facilities are located 41 nm northeast and 32 nm southeast of the Kapustin Yar telemetry/tracking facility, respectively. With the telemetry/tracking facility, these two facilities form a vee opening downrange inclosing both primary and secondary launch azimuths. The Lake Elton facility (Figure 9), to the north of the flight path, has electronics equipment facing south, into the range. The opposite is true of the Verkhniy Baskunchak, which is located south of the range and looks north.

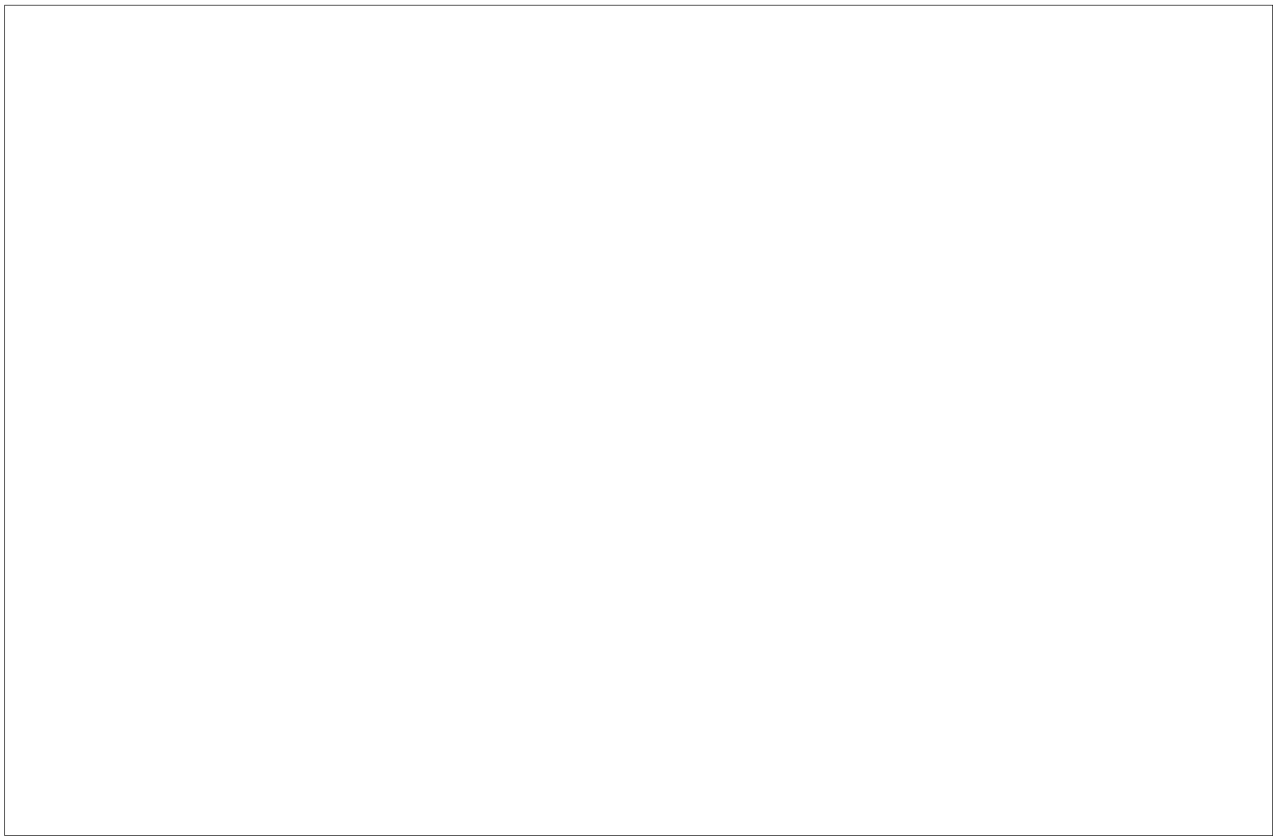
These two facilities are practically identical except for their orientations. Each has a first-generation interferometer, probably abandoned, identical to the interferometer at the telemetry/tracking facility; a van-mounted SHIP WHEEL antenna (radar C); a cinetheodolite (formerly radar A); and a cylindrical optical device shelter. The only visible equipment difference is an additional cinetheodolite at Verkhniy Baskunchak. There is also a building in each facility that resembles the standard tracking facility control building (as at the telemetry/tracking facility).

It is probable that the interferometers at these two facilities are no longer active, probably having been replaced by the construction of second-generation interferometers at Turgay and Shungay in the summer of 1965. These two devices were apparently intended to update the near range space positioning capability Whether or not this obviated the need of the older interferometers is not determined. However, their appearance remains the same.

The overall appearance of the Lake Elton and Verkhniy Baskunchak facilities is slightly different than other downrange tracking facilities. Neither site has a large number of vehicles or a motor pool. There is a relatively small number of support buildings at each. Each facility contains, in addition to the instrumentation mentioned above, approximately eight major support structures and several minor sheds. This seems to indicate that the two facilities are not involved in missile component recovery operations as are tracking facilities further downrange.

Finally, a remote communications area at each location has been identified. These areas are small and could contain, at most, a single dipole. Antenna type cannot be determined; however, the remote communications area at Lake Elton tracking facility is located slightly north of the main area on a ridge, perhaps giving it line of sight to the rangehead.

Shungay and Turgay Tracking Facilities. These two facilities were constructed near existing ASM-related facilities in the near range. The Shungay facility (Figure 10) is located 24 nm east of the Kapustin Yar telemetry/tracking facility, 36 nm south of Lake Elton tracking facility, and is adjacent to the northern facility (L-1) of



the ballistic vehicle tracking complex. The Turgay facility is 35 nm east-southeast of the telemetry/tracking facility, 12 nm northeast of Verkhniy Baskunchak, and is located south of the support base of the ballistic vehicle tracking complex.

These two devices are identical to the second-generation interferometers deployed at Sary Shagan, and are an improvement over the earlier first-generation interferometric instruments previously described at the Kapustin Yar telemetry/tracking facility, the Verkhniy Baskunchak tracking facility, and the Lake Elton tracking facility. The design base leg length was increased from 390 feet to 580 feet and there are an increased number of ambiguity-resolving antenna positions. As is true with all interferometeric devices near the Kapustin Yar rangehead, their base leg orientation is north/south and east/west.

Terekty Tracking Facility. This facility (Figure 11) is located 100 nm east-southeast of the telemetry/tracking facility. Electronics and optical equipment located on the north side of the facility consists of one cinetheodolite, one cylindrical optical device shelter, one van-mounted SHIP WHEEL radar, and two BAR LOCK radars. A large amount of mobile equipment is located immediately north of the electronics equipment and some of this equipment is possibly instrumentation. An additional area containing possible instrumentation is at the southeast edge of the

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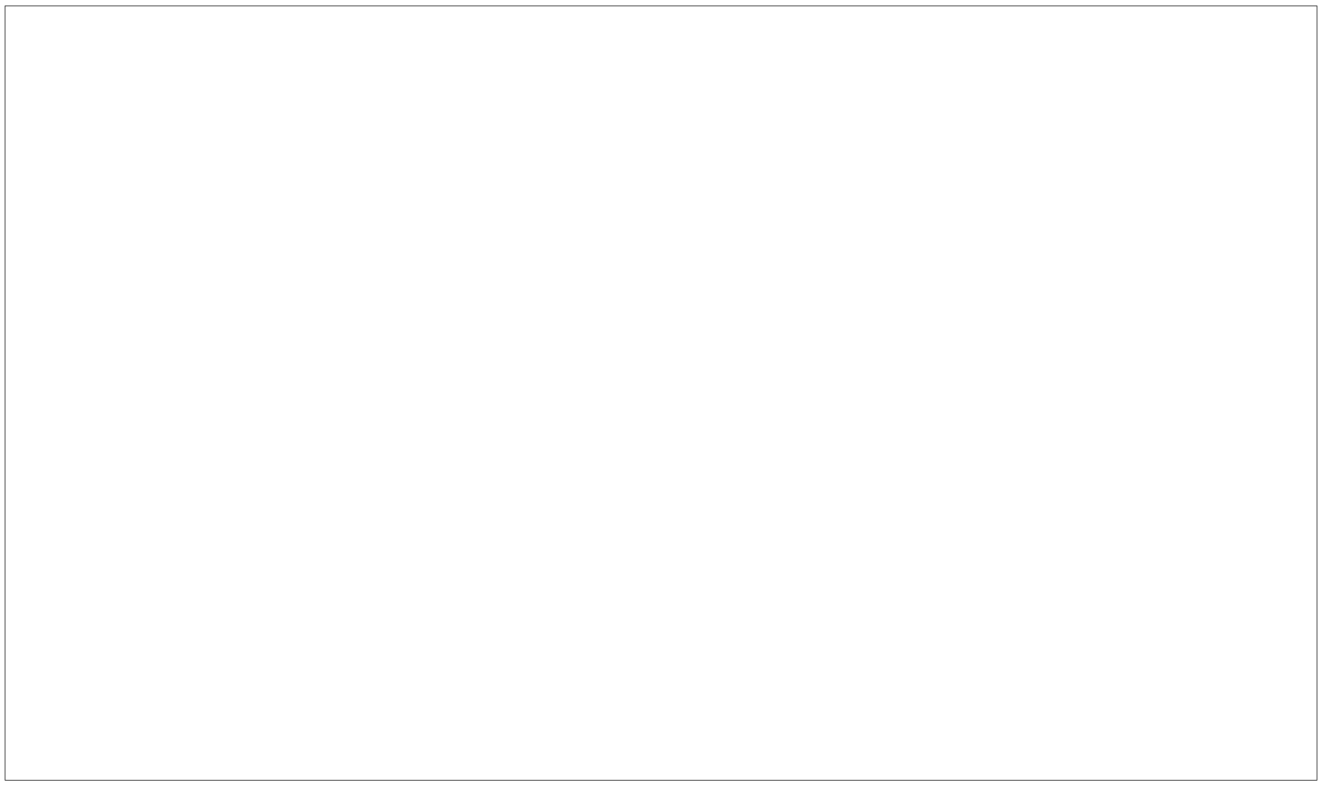

facility. This area contains a self-supporting lattice tower, two buildings, seven vans or vehicles, and four undetermined objects. Photography of February 1969 revealed a second-generation interferometer under construction on the south-southwest edge of the facility. This interferometer is identical in configuration to the interferometers under construction at Makat and Emba tracking facilities 4 and 5 and has base leg orientations north/south and east/west.

There are two remote communications areas, one east and one north-northwest of the main facility. They jointly contain three HF dipoles generally oriented toward communications facilities at the rangehead, and two masts that are possibly VHF antennas. Interpretability of available photography does not permit positive identification of these antennas as VHF or identification of equipment mounted on the self-supporting tower previously mentioned.

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The basic function of the facility is tracking and telemetry collection from ballistic and cruise missiles passing over or impacting in the area. The tracking capability of the facility will be greatly enhanced by the activation of the new interferometer, which if paired with a similar device, would extend the positive tracking capability (that is, accurate range, azimuth, and elevation data) of the range. Factors pointing toward a broader function for the facility are the presence of 21 support buildings, the motor pool, the large number of vans and vehicles, the

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adjacent associated airfield, and the presence of AW radars. These factors indicate that the facility is probably involved in the recovery of impacted vehicles in nearby impact areas.

Novaya Kazanka Tracking Facility. The facility (Figure 12) is located 133 nm east-northeast of the telemetry/tracking facility and 59 nm northeast of Terekty tracking facility.

The electronics and optical components are located on the northern side of the facility and consist of one cinetheodolite; one possible cylindrical optical device shelter; a roof-mounted four-element helical array, two SHIP WHEEL radars (one van mounted in the radar C configuration and one roof mounted on the corner of a standard tracking facility control building), and a telemetry building with five roof positions. There are a great number of objects scattered throughout this area that are probably electronics equipment of various kinds. A possible HF dipole antenna is adjacent to the northwest side of the control building and is oriented toward the rangehead. There are two other instrumentation/communications areas, one located north and the other east of the facility. No electronics can be positively identified in these areas.

The function of the facility is apparently similar to the function of Terekty. It is considerably larger (49 support structures); there is an adjacent airfield, more mobile equipment, considerably more electronics; and it is close to what is probably a more active impact area (130-150 nm). All elements necessary to support both tracking/telemetry data reception and support of vehicle recovery operations are present.

Auzy Kuduk and Taskuduk Facilities. The facilities are located 128.5 nm and 159 nm, respectively, from the telemetry/tracking facility. These facilities are extremely small and positive identification of electronics equipment is not possible. Auzy Kuduk is the larger of the two facilities, consisting of 12 buildings. A probable van-mounted SHIP WHEEL radar is located adjacent to the westernmost buildings of the facility. This is the only piece of identified electronics equipment. The Taskuduk facility contains five secured buildings plus four nearby possible housing structures. No electronics equipment could be observed at this facility. A significant fact relating to the function of these two facilities is their geographic location. Both facilities are located almost directly underneath the ballistic trajectory of a missile launched from Kapustin Yar rangehead to impact in the Sary Shagan impact area.

Makat Tracking Facility. The facility (Figure 13) is located 306 nm downrange from the telemetry/tracking facility. It is bordered on its east edge by the Sagiz river, and extends over a considerable area west of the river. The airfield associated with the facility is located on the western edge of the built-up area. Electronics

equipment located throughout the facility includes three van-mounted probable SHIP WHEEL radars, two cylindrical optical device shelters, a first-generation interferometer similar to the ones at Lake Elton and Verkhniy Baskunchak, but with a number of additional antenna pads, a second-generation interferometer under construction, a BAR LOCK radar, and a STONE CAKE radar. No communications antennas can be identified; however, there are two areas where mobile communications equipment is apparently parked.

The antenna configuration of the first-generation interferometer is unique. The north/south base leg has six antenna pads at the south end and one at the north end. The east/west base leg has three pads at the west end and one pad at the east end. There are no apparent antenna pads in the center of the device. It is possible that this device has increased capabilities because of the additional antennas. The second-generation interferometer was first observed under construction on photography

Coupled with identical interferometers presently under construction at Terekty and Emba 4 and 5 tracking facilities, and the Kapustin Yar rangehead interferometers, the new Makat interferometer will contribute to an interferometeric network providing positive tracking data from rangehead to Emba. In addition to tracking vehicles impacting downrange, the Makat interferometers are used to track vehicles impacting at the Makat impact area and launched from the Makat field launch point for impact at Sary Shagan. The size of the facility (66 structures of various sizes) as well as the equipment deployed here, indicates this facility supports missile launches and the recovery of impacted missiles in adjacent impact areas as well as performing a tracking function.

Emba Missile Test Center Tracking Facilities 4 and 5. As mentioned above, a missile traveling in a ballistic trajectory from Kapustin Yar rangehead to Sary Shagan impact area passes above the tracking patterns of the Emba Missile Test Center and the Tyuratam Missile Test Center. There are known instances where range instrumentation facilities attached to one range have aided another range.[5] Recent construction activity at Emba Tracking Facilities 4 and 5 indicates that these two facilities are to perform an expanded tracking role, probably in relation to missiles launched from Kapustin Yar. At each of these facilities a second-generation interferometer, very similar in overall dimensions to the second-generation interferometers at Sary Shagan, is under construction.

These new interferometers (Figure 14) apparently have a slightly longer base leg (600 feet) and a slightly longer distance between the probable alignment antennas on the rim of the circle (1,160 feet) than the earlier second-generation interferometers. The orientation of these instruments is parallel and perpendicular to the Emba

range azimuth of 190 degrees. While this would seem to indicate a direct association with Emba range programs, it does not rule out use in Kapustin Yar range programs. In fact, the two ranges are close to being perpendicular to one another and the two new interferometers are on either side of both nominal range azimuths.

An additional factor involves the missile program at Emba. Present missile activity at Emba is believed to be restricted to SA-4 and SA-6 testing. SAMs 1 through 4 were developed, tested, and deployed without any apparent need or use of precise interferometric data. Thus, the interferometer deployment at Emba indicates that either a new missile system is under development at Emba that is more than an ordinary SAM or the interferometers are for the Kapustin Yar range. The second possibility is supported by positive evidence of SS-12 missiles being launched from Kapustin Yar rangehead and impacting in the middle of the Emba tracking pattern, and by the concurrent construction of new interferometers at adjacent Kapustin Yar tracking facilities.

One possible function for these interferometers is the tracking of warheads launched toward the Sary Shagan impact area during the deployment of decoys or multiple reentry vehicles. If the deployment took place before the warheads were within the range of the Sary Shagan or Tyuratam interferometers (over Emba), the interferometers at tracking facilities 4 and 5 would be necessary to evaluate the deployment system. In conclusion, because of their ideal location for dual range usage, positive determination of the uses of these devices can probably not be obtained from photography.

Tyuratam Tracking Facilities. The ballistic path of a missile launched from Kapustin Yar headed for impact at Sary Shagan crosses the Tyuratam tracking pattern approximately 45 nm north of Tyuratam tracking facility 1 and 60 nm north of tracking facility 2. The closest interferometers are at tracking facility 4, 75 nm north, tracking facility 3, 120 nm north, and the Tyuratam rangehead tracking facility, 105 nm south.

Any of these facilities could optically or electronically track a Kapustin Yar/Sary Shagan vehicle in the portion of its track above their electronic and optical horizons. However, there is no visible evidence at any of these facilities that would suggest they are tracking Kapustin Yar/Sary Shagan missiles.

Sary Shagan Impact Area. The extensive complex of Sary Shagan tracking facilities that surround and extend uprange from the 1,050 nm impact area are not the direct concern of this report. However, data on the incoming vehicles collected by these facilities contributes to the base knowledge being gathered on the Kapustin Yar launched vehicles and so they are, in effect, Kapustin Yar impact area tracking facilities.

One facility, Sary Shagan tracking facility 4-A (Figure 15), (0245-48A) appears to be associated solely with incoming warheads. This facility, and its associated communications facility, HF communications facility 3, are located south of the impact area. Its major identifiable electronics components are three van-mounted SHIP WHEEL radars and two HF 5-3-3-5 fishbone antennas. The fishbone antennas have a receiving azimuth of 288 degrees, and are directed at the Kapustin Yar rangehead. The SHIP WHEEL radar and other undetermined equipment are emplaced in two small areas on a ridge north of the support area.

This facility has the equipment necessary to receive the timing tone directed from Kapustin Yar rangehead on HF, track and collect terminal telemetry data until impact using the SHIP WHEEL radars, and other possible telemetry collection equipment. The facility is also connected to the impact area by road and has an adequate number of vehicles to perform warhead recovery operations. This small facility, equipped to perform a terminal telemetry and warhead recovery function, is insufficient in size and complexity to fit adequately into the broader function of the major Sary Shagan tracking facilities.

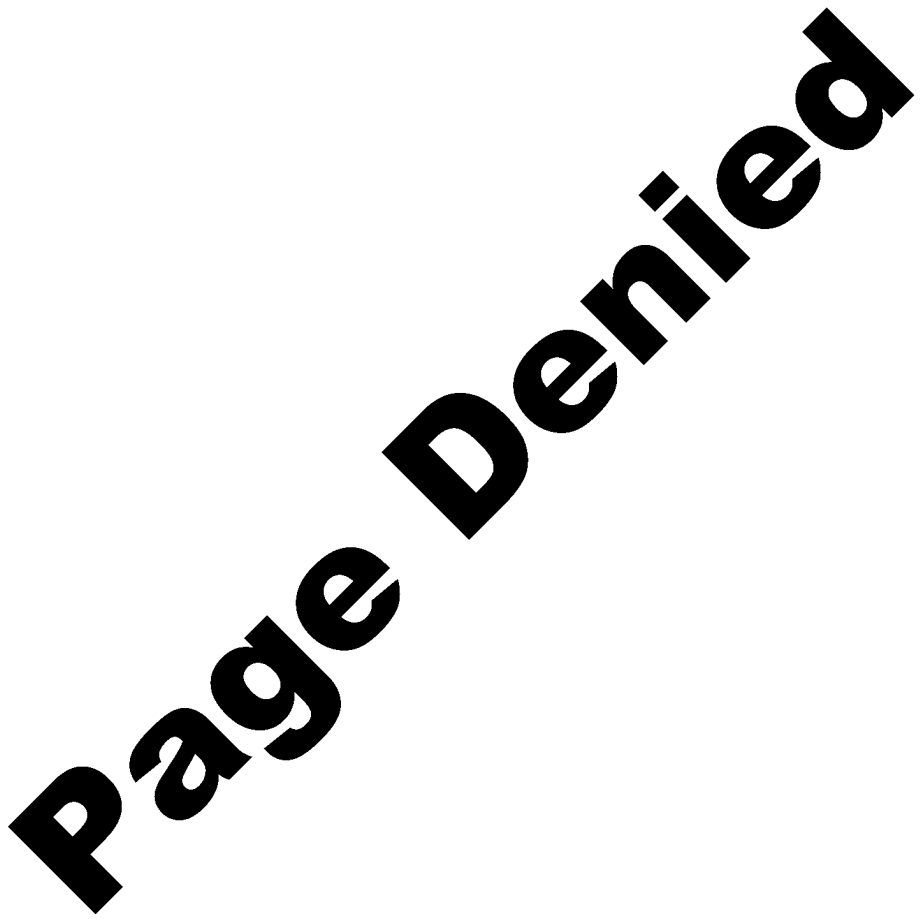
Downrange tracking facilities, either associated directly with Kapustin Yar or basically part of another range, appear to be capable of tracking a Kapustin Yar vehicle continuously from launch until impact. This may not be a common practice, but the capability to do so apparently exists. The extension of tracking facilities from rangehead launch facilities to the 1,050 nm impact area is evidently necessary to support downrange impact and launch areas. This large amount of instrumentation allows extremely flexible use of the overall range area.

Vladimirovka Advanced Weapons and Research Complex Air-to-Surface Instrumentation

The air-to-surface instrumentation facilities located at the Vladimirovka Advanced Weapons and Research Complex rangehead serve two areas among the many target areas where air-to-surface weapons are tested at the rangehead.

East of Akhtubinsk, and between that city and launch complex D, there are many target areas set up with targets (usually aircraft) for strafing and bombing. These areas include a dummy airfield, a series of circular ground target markers, and single aircraft placed, apparently at random, out in open areas. Launch complex G is also used as a target and has been cratered. None of the target areas mentioned have any apparent instrumentation.

The two areas functionally associated with air-to-surface weapons testing and evaluation that have instrumentation are the Kapustin Yar bombing range located



to the rear of launch complex D and Kapustin Yar ballistic vehicle tracking complex, located approximately 23 nm east of launch complex D.

Bombing Range and D Instrumentation Group

The bombing range is a set of ground target markers placed on and outside the hypotenuse of the right angle triangular pattern of three instrumentation facilities (D-2, D-3, and D-4). The facilities are approximately 3.4 nm apart along the legs of the triangle, the hypotenuse (from D-2 to D-4) is approximately 4.8 nm.

The bombing range facilities appear to operate on a triangulation principle. Aircraft drop bombs or other air-to-surface weapons at a target along the hypotenuse or near it. Instrumentation at each facility is sighted in on the smoke plume the weapon emits on inpact. The angular data recorded by the instruments is correlated and the exact point of impact is determined. The instrumentation at the bombing range does not appear complex enough to track falling shapes or bombs.

Equipment at the three facilities is not complex. The basic component of each facility is a two-story building with an instrument deck on the roof. The buildings at the terminal sites (D-2 and D-4) are similar to the site at the apex (D-3); however, both terminal site buildings are slightly smaller. This type of building is the only structure at D-4. D-2 contains two smaller sheds, a mobile equipment pad, and several unidentified objects in addition to the standard building.

D-3 (Figure 16) is more complex; in addition to serving the bombing range, D-3 is a communications facility. This accounts for the 11 structures and the additional equipment. Some of the communications equipment is probably ground-to-air communications for operations on the bombing range. However, the two rhombic antennas are more appropriate for point-to-point communications. Azimuths for the two rhombic antennas are shown on Figure 16. No logical correspondents for these antennas have been found.

The D instrumentation group consists of three facilities (D-1, D-6, and D-7) in addition to the triangular pattern of three facilities (D-2, D-3, and D-4) around the bombing range. One additional facility (D-5), once considered to be an instrumentation facility of this group, can now be identified as a communications facility. All of these facilities, excepting D-5, are electronically connected by a cable scar. The functional relationship between the three bombing range facilities and D-1, D-6, and D-7 is difficult to detect.

D-1 differs in appearance from all other instrumentation facilities on the range. Previously it was considered to be an operations control center, but this does not now seem likely because of the communications equipment located at D-3 and D-5. The

facility may have an administration and maintenance function. Electronics equipment identified at D-1 consists of a van-mounted SHIP WHEEL radar.

The apparent relationship of instrumentation facilities D-6 (Figure 17) and D-7 and launch complex D has been explained previously (see Kapustin Yar SSM instrumentation, launch complex-associated instrumentation facilities, other instrumentation groups). This relationship, however, does not explain the apparent cable connection with the bombing range D facilities. Two reasonable explanations are: D-6 and D-7 perform an additional electronics function related to activity at the bombing range or they are cable connected to the communications facility at D-3. It is probable that both explanations are true, thus giving D-6 and D-7 a dual function.

Both facilities consist of a square two-story building with an instrument deck, a probable cylindrical optical device shelter, and a probable power generator shed. D-6 has an additional shed, several undetermined pieces of equipment, and a mobile equipment pad occupied by a van-mounted SHIP WHEEL radar.

Ballistic Vehicle Tracking Complex

This complex is an expanded form of the triangular pattern of instrumentation at the bombing range. The complex consists of three main facilities L-1, L-2 (Figure 18), and L-3 which form a right triangle with ground target markers along the hypotenuse (Figure 1). Also, there is a facility (L-4) extending the east/west leg of the triangle eastward, a base support for the complex, and two small sites (L-2A, and L-2B) along the east/west leg between L-2 and L-3. Distance from L-1 (the northern facility) to L-2 (the apex facility) measured along the north/south leg of the triangle is 12 nm. Distance from L-2 to L-3 and L-4 along the east/west leg is 10.7 nm to L-3 and 16.2 nm to L-4. The distance along the hypotenuse from L-1 to L-3 is 15.2 nm.

Instrumentation equipment present at the three main facilities, L-1, L-2, and L-3, suggests the use of the complex, because these facilities each contain three cinetheodolites (two at L-3), a van-mounted SHIP WHEEL radar, and an instrumentation building with probable optical equipment mounted on a roof instrument deck. This large amount of optical equipment indicates that ballistic objects dropped over the complex are optically tracked to impact. Correlated optical data would enable determination of exact flight characteristics of the objects.

The exact function of L-4 in the overall operation of the complex cannot be determined until equipment identifications can be made; however, it is evident that the presence of this facility represents an expansion of tracking capability at the complex. In November 1967 a possible 75-foot inflatable radome was identified at L-4. At this time it appeared flat on the ground and deflated. Subsequent coverage

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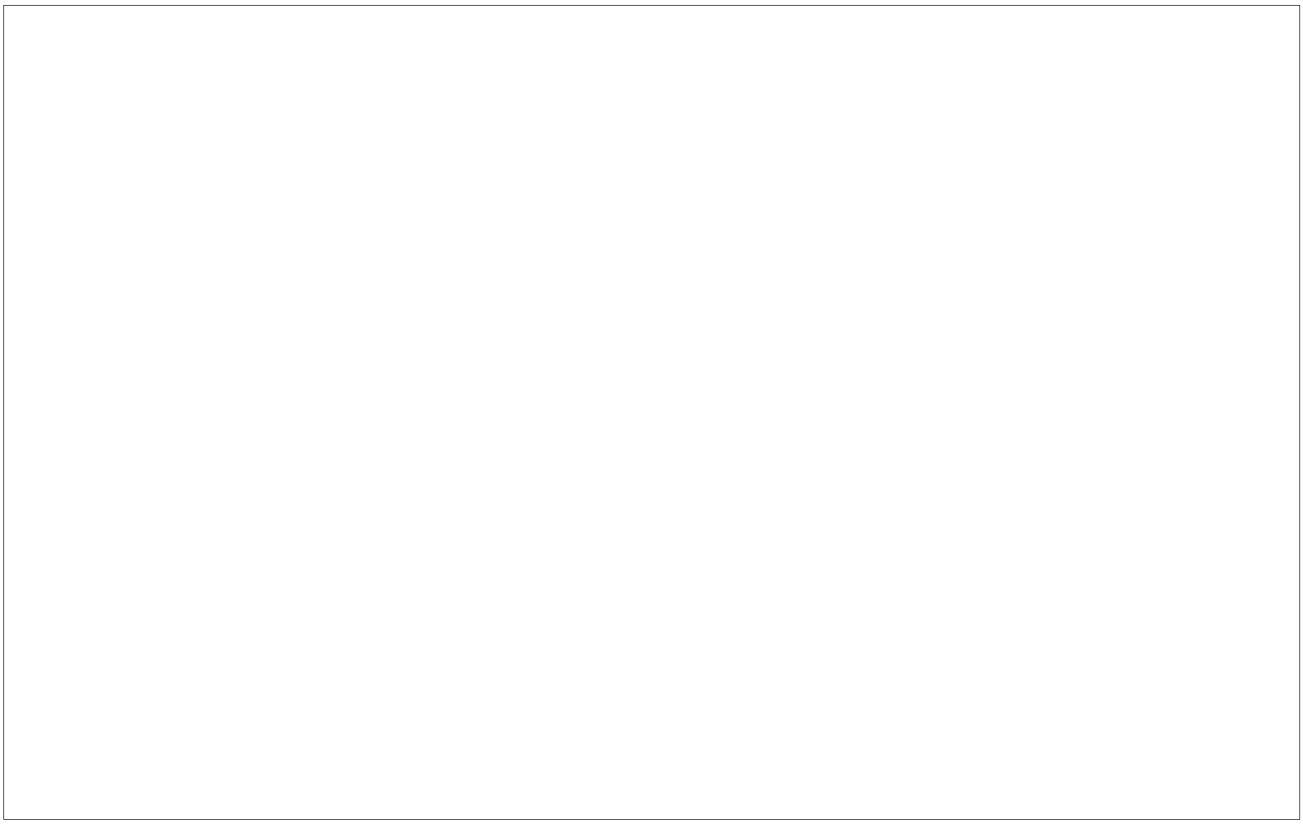

revealed this object, whatever its nature, had been removed. No other equipment is of adequate size to be identified at this facility.

Recent photography permits identification of equipment and equipment positions at L-2A and L-2B. Each of these facilities has a rectangular hardstand located in the northern section of their secured area. The hardstands at both facilities have been observed occupied by SHIP WHEEL van-mounted radars. In addition to the SHIP WHEEL van-mounted radars, each facility appears to have a probable optical instrument position on the roof of the main building. Also, L-2A has an additional optical instrument building similar to a building at L-3. The equipment present indicates that L-2A and L-2B have probably been added to the complex to increase the accuracy of data and do not indicate a change or addition to the overall complex function.

The support area for the complex is located 2 nm south of the east/west leg at the town of Turgay. This area also serves as support for the Turgay interferometer located 1.2 nm east-southeast. A similar support arrangement was made with the Shungay interferometer which is 0.9 nm west of L-1. These interferometers are related to SSM operations and were placed at the complex for convenience.

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Extensive air-to-surface weapons activity takes place at Vladimirovka Advanced Weapons and Research Complex. While a great deal of this activity does not utilize identifiable instrumentation, the two instrumentation areas analyzed in this report, especially the ballistic vehicle tracking complex, play an important role in the development, perfection, and accuracy of new air-to-surface weapons.

Some of these facilities serve SSM activity as well. Certainly D-6 and D-7 have dual roles and optical instruments at the ballistic vehicle tracking complex could provide photographic coverage of SSM launch vehicles during their burn phase. Any of these facilities, placed separately in an area, could be mistaken for a SSM data collecting facility. It is their geometrical relationship to one another, their equipment, and the surrounding features (ground target markers, craters, and destroyed aircraft) considered together that aid in positive determination of their specific function.

Kapustin Yar AW Radar Facilities

There are seven AW radar facilities at the Kapustin Yar/Vladimirovka rangehead. This does not include the electronics testing facility or the five Kapustin

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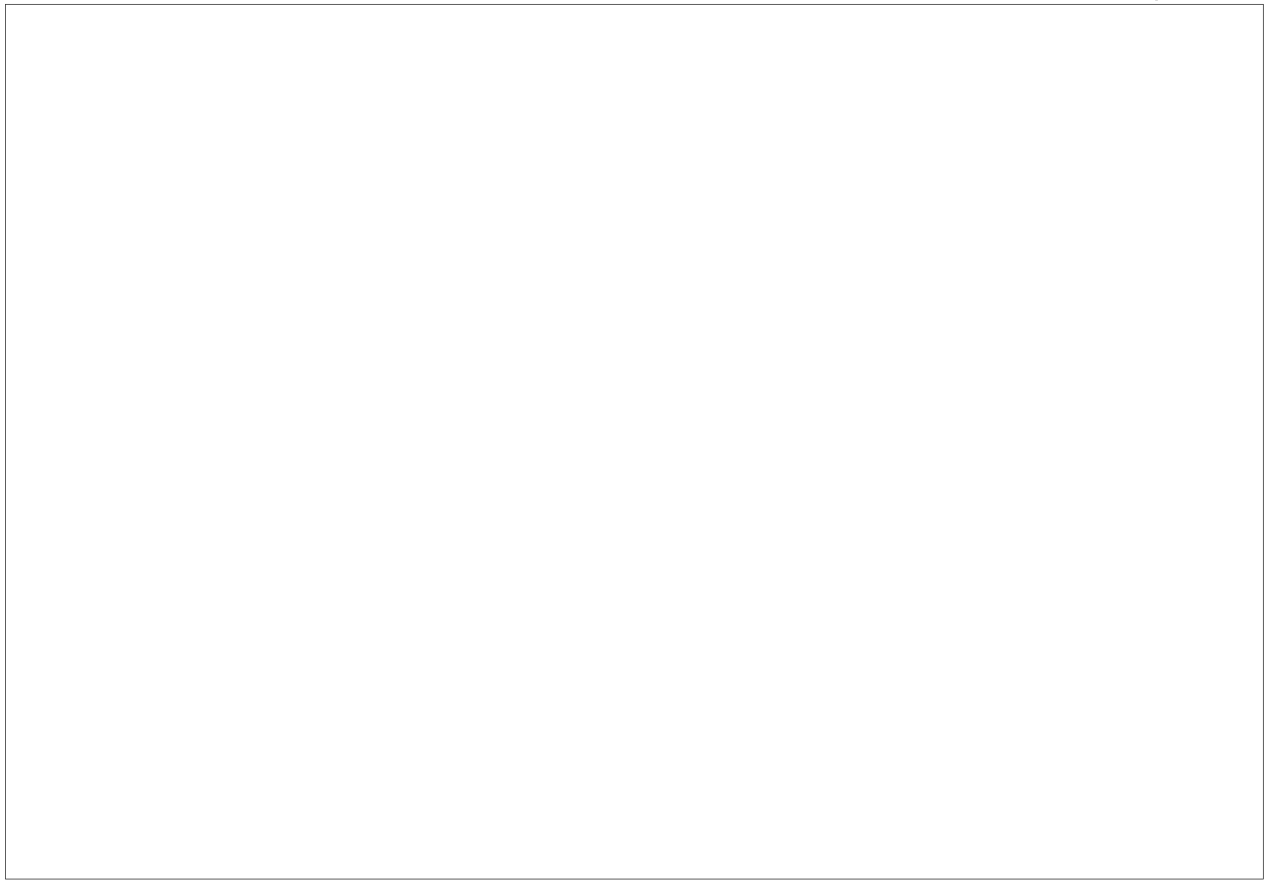

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Yar SAM range AW facilities which were reported in a previous report on SAM range electronics.[1] Of the seven facilities, two are inactive and unoccupied (G1 and G2), two are large and are located at Kapustin Yar Airfield and Akhtubinsk/Vladimirovka Airfield (Figure 19), and three are small facilities probably performing air traffic control functions for the range (G-3 and Vladimirovka Air Traffic Control Facility operations areas A (Figure 20) and operations area B).

Air Warning Radar Facilities

AW Radar Facilities G-1 and G-2. These facilities are located to the west of launch complex G and were constructed at the same time as the H-shaped AW facilities associated with Kapustin Yar SAM Range. These two sites do not appear to be associated with the SAM range program because of their location and lack of activity.

G-2, a facility with a conventional H-configuration identical to Elton, Gorneyy Balkley, and Pallasovka AW radar facilities, has not been observed to contain radar. G-1 has been considered an AW radar facility, because its configuration, combined with the H-configuration of G-2, closely approximates the configuration of Kamyshin and Alexandrov Gay AW radar facilities. G-1 was observed to be occupied by a probable BAR LOCK radar and a probable STONE CAKE radar on April 1964 photography. Several recent coverages have shown the facility to be occupied by numerous vans, but no radars. Whatever their intended original purpose, neither of these facilities can be considered an active AW radar facility.

Kapustin Yar Airfield AW Radar Facility. This facility is presently being expanded with the addition of new equipment positions. The facility is located immediately south of Kapustin Yar Airfield in the northwestern corner of the Kapustin Yar SAM Range Support Base. The original site contained three radar mounds in an east/west line with a series of flat pads extending the line to the east. Three buildings behind the line of pads support the facility. Prior to the first indications of construction, the facility contained two BACK NET radars on two of the mounds, a probable SIDE NET radar on the third mound, a BAR LOCK radar, a ROCK CAKE/STONE CAKE radar, and a SQUAT EYE radar. Construction was first observed on the new area behind the radar mounds in November 1966. In May 1967, the BACK NET radars were removed. At the same time, the mobile TALL KING radar was removed from the Kapustin Yar Electronics Test Facility and placed at the eastern end of the radar line, evidently to replace the BACK NET radars. More recent coverage shows that construction in the new area appears complete with the addition of four van pads, two equipment aprons, and a new

control building. Vans and vehicles have been positioned upon the pads and aprons, however, coverage has not been adequate to determine the nature of these vans and vehicles. The radar mounds have not been re-occupied.

Akhtubinsk/Vladimirovka AW Radar Facility. This facility (Figure 19) is located at Akhtubinsk/Vladimirovka Airfield , adjacent to an aircraft parking apron. It is extensively equipped with standard Soviet AW radars. Equipment present includes two BACK NET, two SIDE NET, four BAR LOCK, two ROCK CAKE/STONE CAKE, and one SQUAT EYE radar. Considering the amount of air traffic around and associated with the Vladimirovka Advanced Weapons Research Center, this is probably not an excessive number of radars. In addition to the actual radars, there are over 65 vehicles and eight buildings to support operations. The configuration of the facility and the equipment has remained basically static for several years.

Probable Air Traffic Control Facilities

Air Traffic Control Facility G-3. This facility is located on the east side of the railroad that serves launch complex D, just south of the railroad turning Y. Because of the proximity of the facility to a support area that is alongside, the actual size of the facility is undetermined. The operational components consist of a hardstand located between two radar mounds, the radar mounds (one is unoccupied and one is occupied by a probable BIG BAR radar), six small buildings, 23 vans/vehicles, and several undetermined pieces of equipment. The small size of the facility, the equipment, and location suggest it is functioning as an air control facility for bombing ranges in the immediate area.

Akhtubinsk Air Traffic Control Facility, Operations Area A and B. This facility consists of two operations areas: operations area A (Figure 20) is located immediately south of the Akhtubinsk/Vladimirovka Airfield support area. Operations area B is located adjacent to an aircraft apron, 0.7 nm east-northeast of operations area A. Operations area B is a vehicle parking area. A BAR LOCK radar, apparently obtained from operations area A, was observed in the area. The presence of this radar was of a temporary nature and possibly related to maintenance activity. Operations area A normally contains two BAR LOCK and two ROCK CAKE/STONE CAKE radar and approximately 24 vans and vehicles. There are at least 13 permanent buildings in the facility. no radars were present in either operations areas.

Assigning exact functions to the seven AW radar facilities at the range is difficult because all occupied facilities, with the possible exception of G-3, are sufficiently equipped and located to perform air warning, air traffic control, or air range safety

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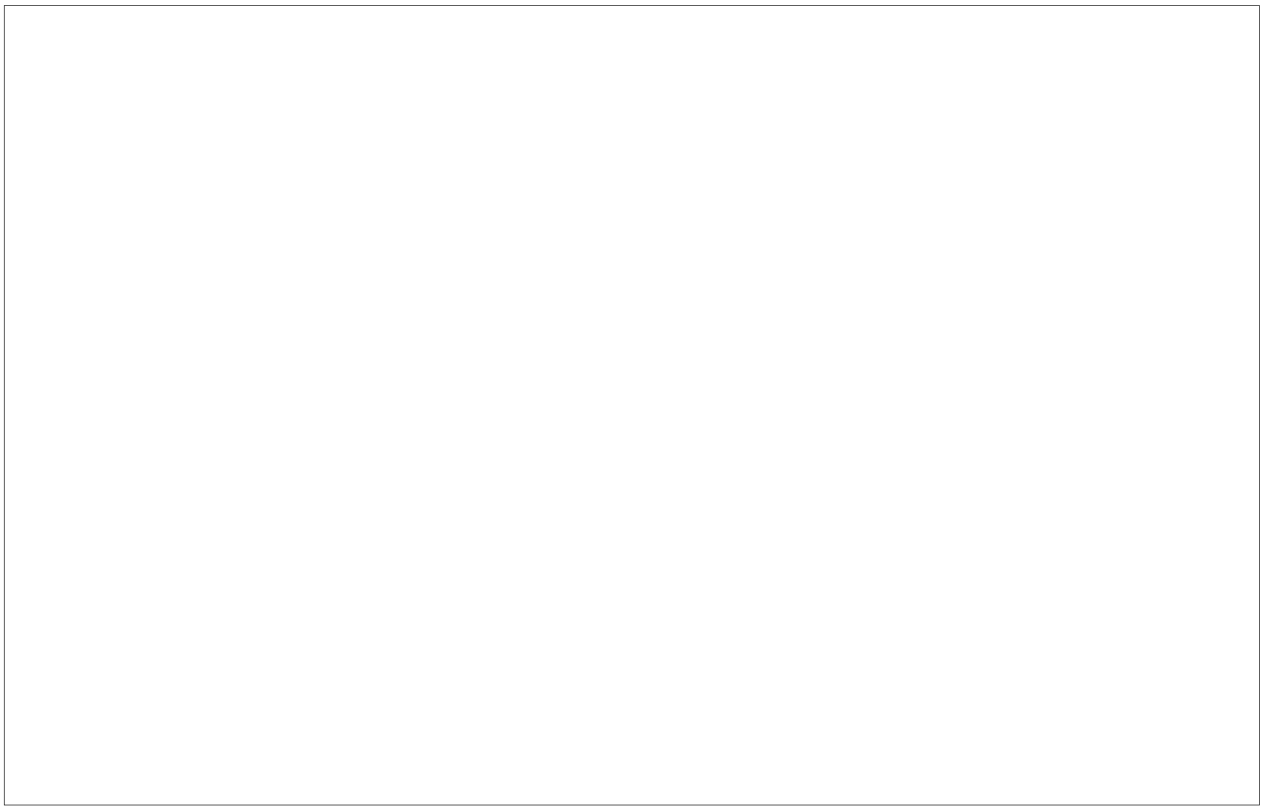

functions, or any combination of these. An adequate number of AW radars are present in the rangehead area to be aware of, and control all aircraft in the vicinity.

Communications Facilities

Communications equipment at the Kapustin Yar/Vladimirovka Missile Test Center can be identified at many locations. In each of the facilities analyzed in the previous sections where there was identifiable communications equipment, it was described with the facility. 25X1

There are indications of extensive use of microwave and VHF equipment. However, in only a few cases has it been possible to identify these types of antennas. Continued large-scale coverage will undoubtedly reveal a VHF or microwave (or both) net extending at least into the near range area and probably beyond.

There are five communications facilities (an additional facility, the Kapustin Yar SAM Communications Facility, was described in a previous report) located at the Kapustin Yar/Vladimirovka rangehead.[1] One of these, collocated with D-3 instrumentation facility, is covered in the ASM section of this report. Of the remaining four, two are large (HF Communications Facility 1 and 2) and two are

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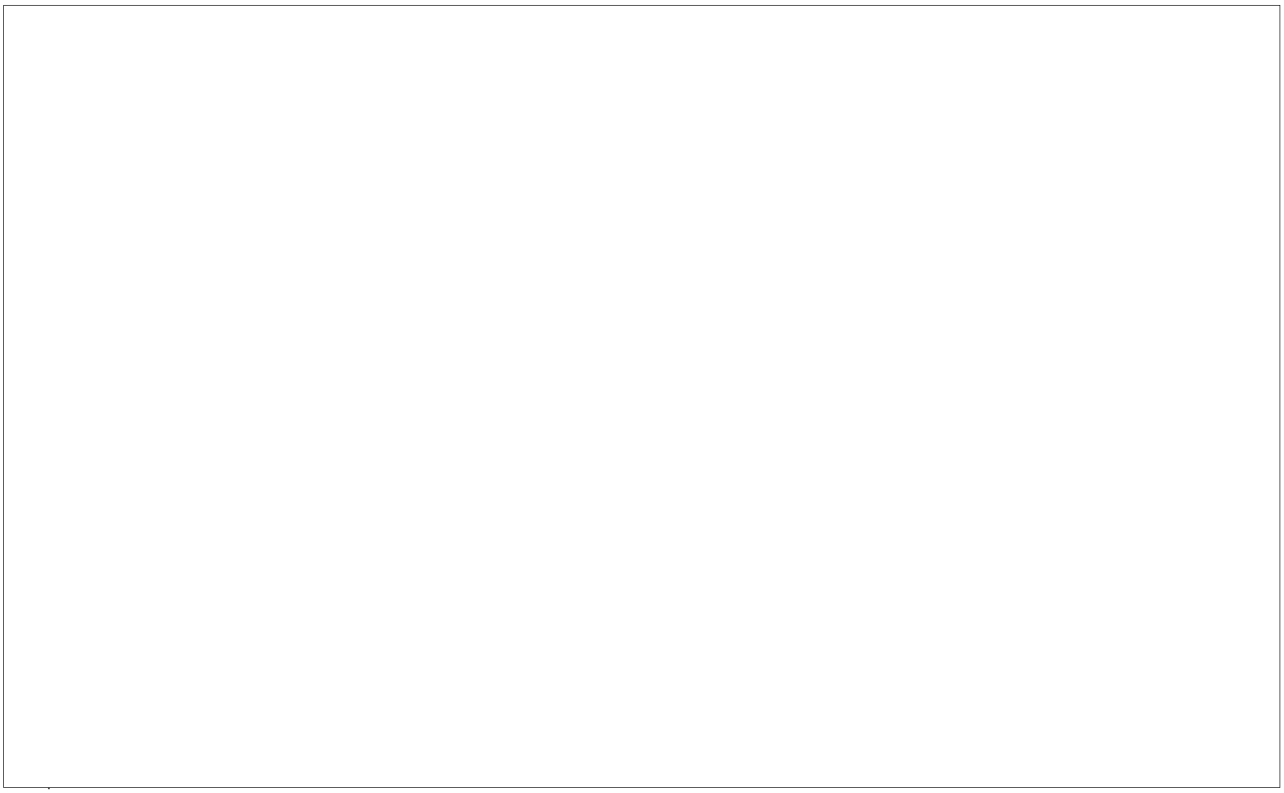

small (HF Communications Facility D-5 and Akhtubinsk HF Communications Facility).

HF Communications Facility 1

This facility (Figure 21) consists of a large rhombic and dipole antenna field surrounding a centrally located transmitter building and associated structures. It is the major HF transmitting facility for the range, and is located 1.8 nm south of the telemetry/tracking facility. There are four pairs of double day/night rhombic antennas, one pair of day/night rhombic antennas, 18 dipole antennas, and four possible VHF antennas in the antenna field. A previous report contains a table and map showing probable correspondents.[6]

HF Communications Facility 2

This facility is the receiving counterpart of HF communications facility 1 and is located 9 nm west of the transmitting facility. It has not been possible to determine the exact number of antennas in the facility. Recent coverage did permit the identification of fishbone antennas, verifying the receiving function of this facility.

While mensuration was not possible, the fishbone antennas observed appeared to have receiving azimuths comparable to the propagation azimuths of antennas at HF Communications Facility 1, indicating the same correspondents.

HF Communications Facility D-5

This facility (Figure 22) once associated with the D instrumentation group can now be identified as a HF/VHF communications facility. Seven possible UHF/VHF antennas and one VHF FORK REST-type antenna are within the security fence. Fourteen hundred feet south of the secured area is a 5-3-3-5 fishbone antenna with This antenna was first observed at the facility in May 1965 and may date from the construction of the facility. reveals that a considerable expansion is underway at the facility. In the field surrounding the secured area there are three 2-2-2 fishbones, five dipoles, and one day/night dipole, a total of nine new antennas in initial stages of construction. Azimuths for these antennas are shown on Figure 22.

The FORK REST-type antenna at this facility was the only VHF antenna on the range from which an azimuth was obtainable. The azimuth at the time of the photography (±5 degrees) covers the ballistic vehicle tracking complex in the near range or perhaps Terekty Tracking Facility 100 nm downrange. (Terekty was observed to have two masts that were possibly VHF antennas). While no definite correspondents can be determined for any of the antennas at D-5, the wide propagation pattern of the dipoles and fishbones would enable these antennas to communicate with practically all downrange tracking facilities within their range and along their general azimuth.

Akhtubinsk Communications Facility

Akhtubinsk Communications Facility is located southwest of Akhtubinsk/Vladimirovka Airfield and 1.1 nm northwest of the Akhtubinsk Air Traffic Control Facility, operations area A. It has a small antenna field containing masts surrounding a small building. The masts are probably supporting UHF/VHF antennas for ground-to-air communications, but this cannot be confirmed on available photography.

Next 1 Page(s) In Document Denied

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