COUNTRY: USSR (UR)

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TITLE: The Manufacture of Anti-Ballistic Missiles at the Machine-Building Plant i/n Artem in Kiev, UkSSR (U)

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ORIGINATOR: [redacted]

REQ REFERENCES: [redacted]

SOURCE: [redacted]

SUMMARY: (c) The Machine-Building Plant i/n Artem in Kiev normally manufactured air-to-air missiles (AAM), but in about late 1967 it established a new branch in the nearby village of Zhulyany to manufacture the 5V61 anti-ballistic missile (ABM). This missile was designed by the Grushin Design Bureau, was transportable on a large truck, had an effective altitude of about 190 kilometers, and had terminal homing guidance. The plant planned to manufacture about 40 missiles a year, but because of manufacturing problems, only finished four or five during 1967-69. Shortly after 1969, the plant expected to begin manufacturing a modified model with the designation 5V63 and with an altitude of 200-220 kilometers. In about 1971, the plant received directions from higher authorities to permanently cease manufacture of ABMs. However, six months later the plant received countermanding instructions and resumed full production. Source believes this six-month halt in production is somehow associated with the SALT-1 negotiations. This report also describes procedures for modifying missile blueprints and includes several drawings: 1) the location, layout, and organizational structure of the main Artem plant, 2) the location and layout of the branch plant in Zhulyany, and 3) sketches of the 5V61 missile.

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Organizational Relationships

1. (C) Design Bureau and Leading Plant: The Separate Design Bureau of General Designer Petr GRUSHIN (Otdelnoye konstruktorskoye byuro gen-konstruktora Petra Grushina--"Grushin's OKB") was headquartered somewhere near the Khimki Water Reservoir in Moscow and designed various AAM and ABM systems for the Ministry of Aviation Industry. The OKB worked very closely with a plant that was called something like the Mechanical Plant (Mekhanicheskiy zavod) and that was located near the Sokol Metro Station in Moscow. This plant was considered to be Grushin's leading plant (golovnoy zavod), because it was equipped and manned exceptionally well and because it normally began the series production of Grushin's newest missiles. Whenever Grushin developed an even newer missile, the Mechanical Plant would transfer production of the missile it was manufacturing to one of several other plants and would then begin to manufacture the newer missile. However, the Mechanical Plant would keep the original blueprints of the transferred missiles, and the other plant that assumed the manufacture could not officially modify its copies of the blueprints until the Mechanical Plant modified the original blueprint. The Mechanical Plant, in turn, had to obtain the permission of the Grushin OKB to make any important "functional" changes. In this relationship of modification authority, the Mechanical Plant had a formal status of being the "blueprint holder" (kalkoderzhatel). However, when employees of the other plants discussed these modifications among themselves, they usually said that "Grushin" had approved or disapproved a modification, without knowing for sure whether Grushin's OKB or the Mechanical Plant had been primarily responsible for the actual decision.

2. (C) Knowledge Limitations: Source's information is limited on the following points:

a. (C) Source emphasized, on his own initiative, that the "O" in the acronym OKB stood for "Otdelnoye" (Separate), not the usual "Opytnoye" (Experimental). He could not explain the significance of this distinction.

b. (C) Source was never at the Grushin Design Bureau and did not know where it was located in relationship to the Khimki Water Reservoir. We did not have a map of Moscow during the interview, and without one, Source did not have the slightest idea where Khimki Water Reservoir was located in Moscow.

c. (C) Source was unsure about the name "Mechanical Plant," because he and his colleagues usually referred just to "Grushin," although they understood that this was not really correct. This report will use the name Mechanical Plant for the sake of convenience. but it may be erroneous.

d. (C) Source was at the Mechanical Plant twice in about late 1967, for about three days each time, and he remembers only that it was about two bus stops from the Sokol Metro Station. Source did not think he would be able to locate the plant, even with a good map of Moscow that showed the metro stations.

e. (C) The interviewer subsequently obtained a metro map, which shows that the Sokol Station is the last stop in a line that extends through northwest Moscow, toward the Khimki Reservoir (see Figure 1 on page 4). Apparently, the Grushin Design Bureau and the Mechanical Plant were in the same section of Moscow and may even be at the same place, but Source had the definite impression that they were at two separate places.

f. (C) Source did not know to which of the ministerial directorates the OKB or Plant were subordinate, nor did he know the names of any personalities in them, except Petr Grushin.

3. (C) Artem Plant: The Machine-Building Plant i/n Artem (Mashinostroitelnyy zavod imeni Artema) was one of several plants to which the Mechanical Plant transfered the manufacture of Grushin's missiles. Before World War Two, this plant had manufactured textiles, but after the war it changed to the manufacture of aircraft components and then later changed again to AAMs. The head of the plant--since when it was a textile factory before the war until he died in the mid-1970's--was Vasiliy Ivanovich VLASOV, who was not a missile expert by education. During the years 1967-1969 and for several years before and after, the plant manufactured the following items, none of which were considered at that time to be particularly modern or sophisticated:

a. (C) A semi-active guided AAM designated URS (expansion forgotten), which had an acquisition range (zakhvat) of 16 kilometers and a striking range (dalnost) of seven kilometers.

b. (C) A modified URS with an acquisition range of 32 kilometers and a striking range of 15 kilometers.

c. (C) An unguided aircraft rocket system designated RS (expansion forgotten; perhaps followed by the number 75). This system consisted of a cannister that hung from the wing of fighter aircraft and shot about eight unguided rockets.

d. (C) A modified RS that shot 12 rockets.

e. (C) A variety of consumer goods that included toy guns, salt-and-pepper shakers, and souveniers.

4. (C) Figures: Starting on page 5, see Figure 2 for the location, Figure 3 for a layout, and Figures 4-5 for an organizational chart of the Artem Plant. The information in paragraph 3 and in Figures 2-5 does not include the Artem Plant's new branch plant, which will be described separately starting in paragraph 6 below. Figures 4-5 contain all the names of people that Source could remember during the interview. Source noted the following:

a. (C) Source did not know the number or names of any of the other plants, but was certain that there were others.

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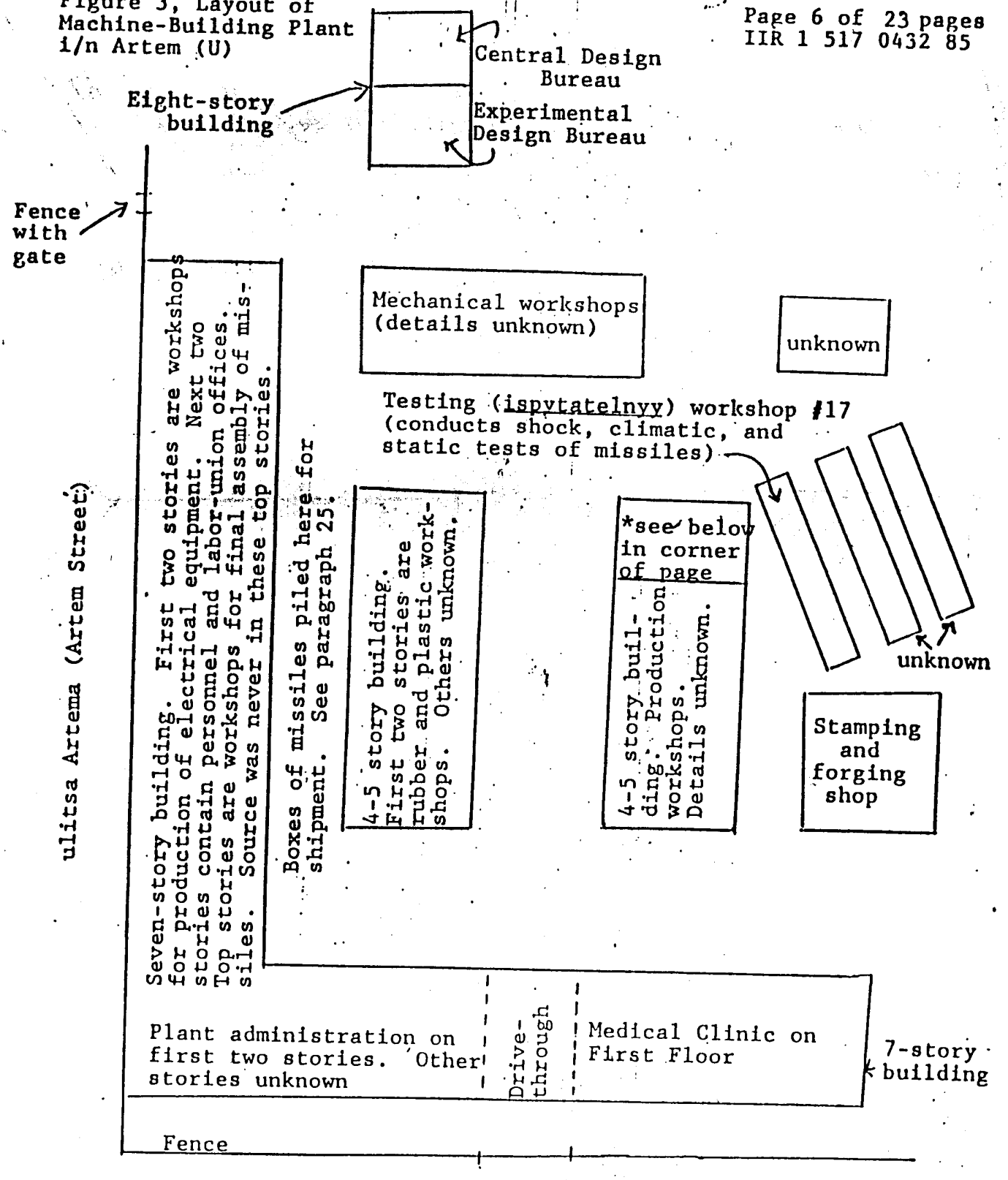
Figure 3, Layout of Machine-Building Plant i/n Artem (U)



* Entrance Control (vkhodnoy kontrol) of components received from other plants--antennas, engines, sensors, batteries, radio components, etc

Figure 4, Organization of the Machine-Building Plant i/n Artem in Kiev (U)

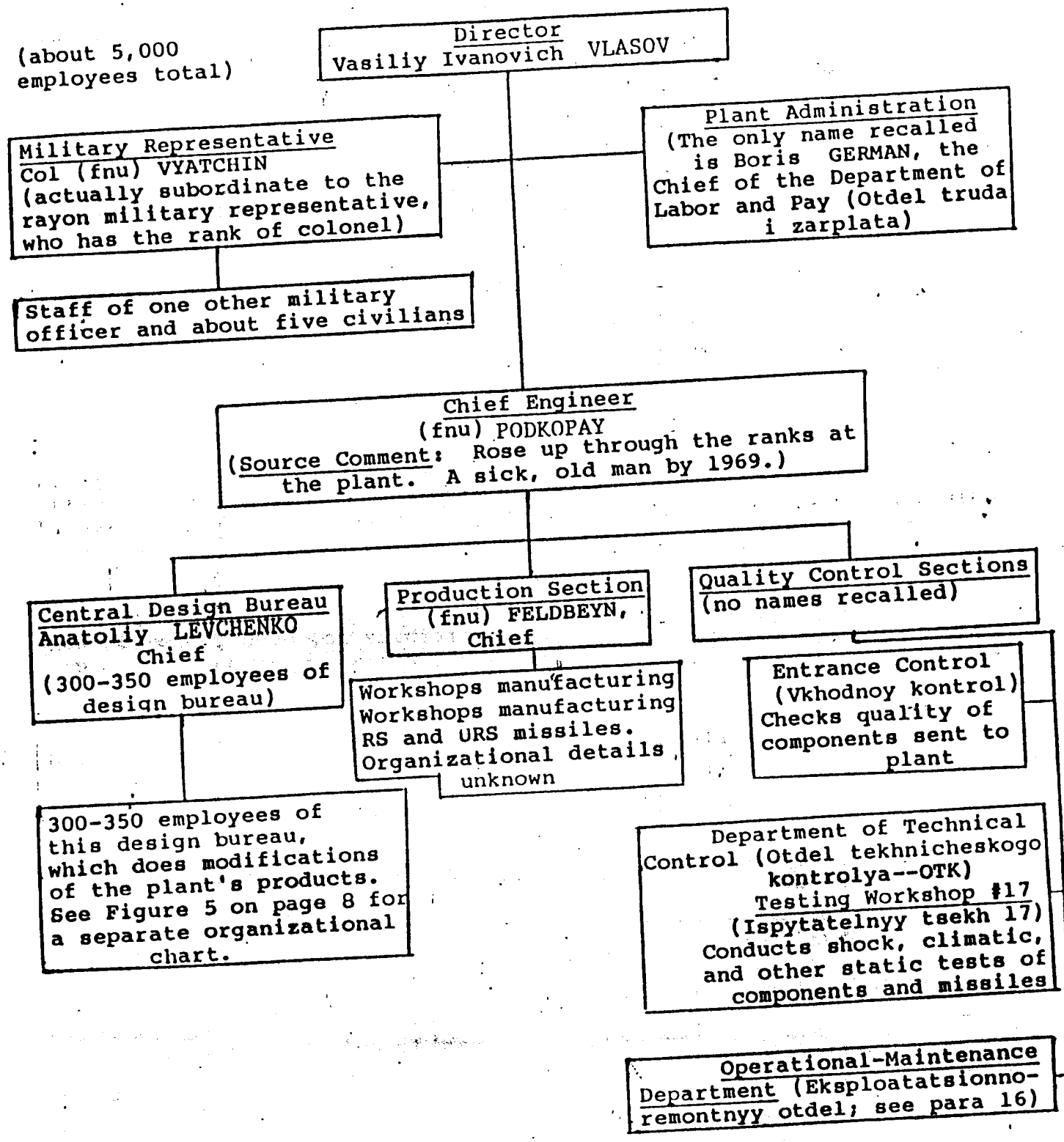
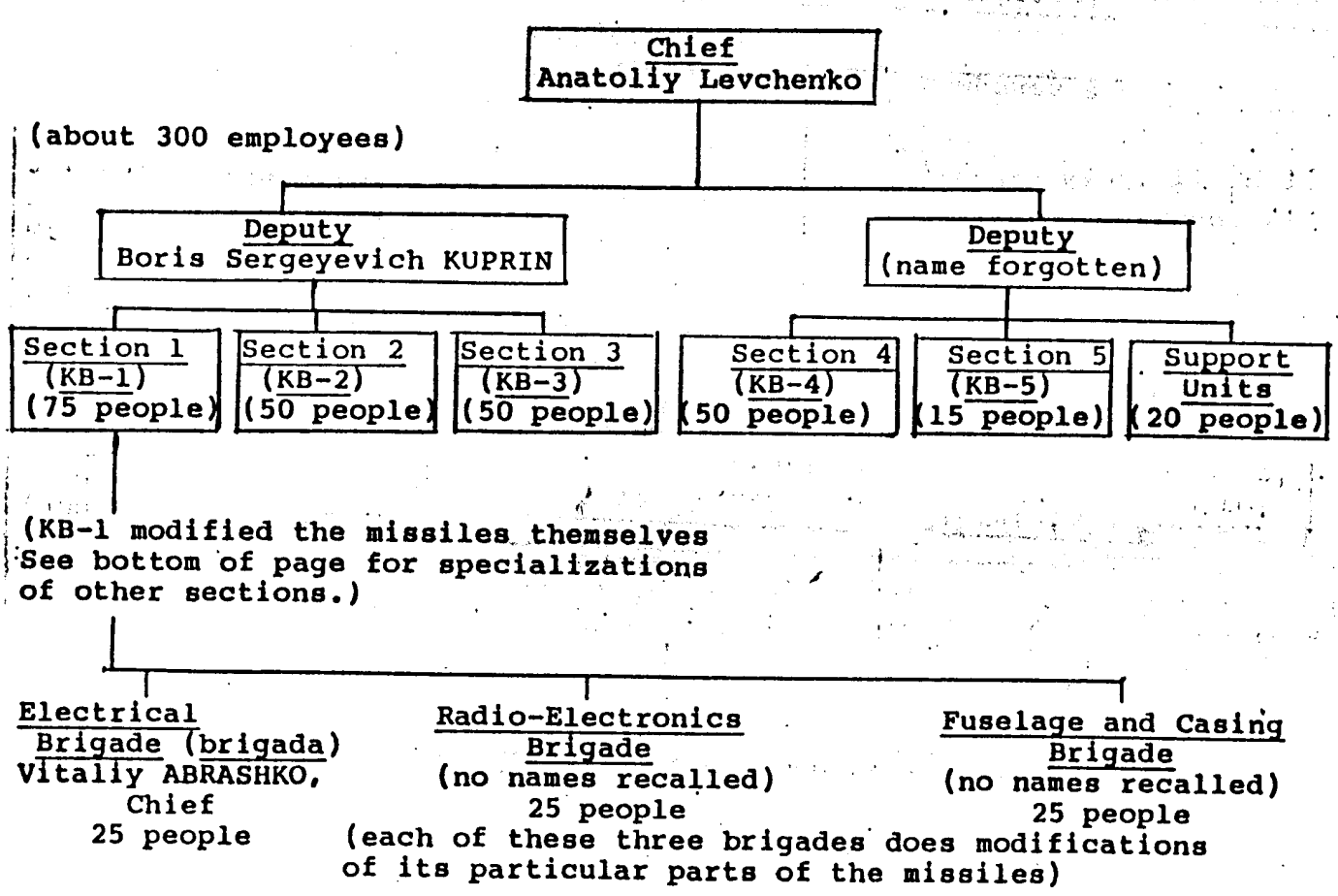


Figure 5, Organization of the Artem Plant's Central Design Bureau



Specializations of other sections of the design bureau:

KB-2: Modifies auxiliary (vspomogatelnoye) equipment of missiles. Section chief is Yuriy TVERDOKHLEBOV

KB-3: Writes documentation for all equipment associated with the missile systems.

KB-4: Modifies all equipment for mobilization and field conditions (dlya polevykh usloviy) of the missile systems.

KB-5: Designs the consumer products of the plant. Designers were normally assigned to this section while waiting for their security clearances.

Support Units: These include the blueprint copying office, the archives (where unclassified correspondence was filed), and the secure library (which had about five employees).

b. (C) Before the mid-1960's, the plant was called Post Office Box 50, but was then required to choose a normal name. The plant chose to be called the Artem Plant, because the it was located on Artem Street. The address of the plant was Artem 50, but Source thought the similarity of the Post Office Box number and the street number was probably just a coincidence. The street is named after a revolutionary hero, and the name of the plant therefore has nothing to do with Artem Mikoyan, the aircraft designer.

c. (C) Source could not remember the telephone or telex number or trade mark of the plant.

d. (C) Source had not heard about any modifications of the missiles or rockets that might have been planned for the years after 1969. He did not know how many missile or rockets the plant manufactured per year or month. He did not know how much they or any of their components cost, except that one URS missile cost 4,000 rubles. (Originator's Comment: Source drew a rough sketch of these missiles and could draw a more detailed sketch of these systems, especially of the electrical subsystems. Source's sketch of the URS does not obviously resemble any standard Soviet AAM silhouette, but it looks more like the AA-6a ACRID than anything else. A better drawing and more supporting details will be obtained in the next interview.)

5. (C) Design Bureaus at Artem Plant: Two separate design bureaus were located in one building (see Figure 3 on page 6) on the territory of the Artem Plant. Each bureau occupied one half of the building and seemed to be roughly equal in size, but the two staffs did not interact in any systematic manner.

a. (C) The Experimental Design Bureau (Opytnoye konstruktorskoye byuro--OKB), headed by (fnu) VIGMAN, was subordinate directly to Grushin's OKB in Moscow, not to the administration of the Artem Plant. Judging from various comments that people made and from equipment that was sometimes in the yard in front of the building, this OKB apparently designed and developed some kind of launchers for surface-to-air missiles. (Originator's Comment: Source could not provide a useful drawing or description of the equipment he saw in the yard.)

b. (C) The Central Design Bureau (Tsentralnoye konstruktorskoye byuro--TsKB) was subordinate to the administration of the Artem Plant and prepared blueprints of modifications of the missiles that the Artem Plant manufactured. The TsKB had to coordinate these modifications with various authorities of the Artem Plant and also with Grushin's OKB and with the Mechanical Plant in Moscow. This responsibility was described briefly in paragraph 1, above, and will be described in more detail in paragraphs 16-20, below.

The 5V61 and 5V63 Anti-Ballistic Missiles:

6. (C) Pre-1968 History: Grushin's OKB designed and developed the 5V61 ABM probably in the early 1960's, and the Mechanical Plant in Moscow began to serially produce it sometime in the mid-1960's. By late 1967, the Ministry of Aviation Industry decided to build a new plant in [redacted] a small town on the south-west outskirts of Kiev to take over the manufacturing responsibility from the Mechanical Plant. Since the Artem Plant had employed practically all the experienced missile manufacturing specialists in the Kiev area, the Ministry also decided to make the new plant a branch of the Artem Plant, rather than to make it an independent plant, although there had been serious discussion of the latter possibility. The Artem Plant could not manufacture the ABMs itself, because it had to keep manufacturing its AAMs and because it did not have room to expand. (Originator's Comment: See pages Figures 6 and 7 on pages 11 and 12 for the location and layout of the branch plant in Zhulyany. Source did not know why the new plant had to be built at Kiev instead of somewhere else.) 25X1

7. (C) Branch Head: The probable head of the new branch was (fnu) SUKACH, who had been a deputy of Vlasov at the Artem Plant. Since Sukach was much more expert than Vlasov in missile technology, Vlasov viewed him as a professional threat and managed to get rid of him in about 1967. Vlasov was without work for about six months, but the timing was very fortunate for him, because he was the natural candidate to head the new branch when the decision was made to build it. He was therefore appointed to that position, and he probably took over the entire Artem Plant after Vlasov died in the mid-1970's. (Originator's Comment: Source was not certain about the truth of this story or even that Sukach headed the branch. Source credited Vlasov's authority to the fact that Vlasov was the brother-in-law of P.V. DEMENTYEV, the Minister of Aviation Industry.

8. (C) Transfer of Personnel from Artem: At the end of 1967 or the beginning of 1968, the Artem Plant administration asked for volunteers from the plant's work force to transfer to the new Zhulyany branch. The administration did not offer more money to these volunteers, but did explain that the volunteers would have opportunities to fill higher supervisory positions in the new departments and workshops that would be organized. Most of the employees decided not to transfer, at least then, because the new branch was not as conveniently located and did not yet offer complete facilities--such as sidewalks, indoor toilets, or a cafeteria. Of the 25 employees in Source's TsKB brigade, for example, only about four agreed to transfer. In fact, those four employees continued to work at the same desks and on many of the same projects, because the new branch still did not have enough offices and work for a complete transfer. When these "transfered employees" did need to actually go to the branch plant to examine some piece of equipment, they would take the train there, conduct their business, and then return to the Artem Plant. Because of this situation, the administration did not pressure many employees to transfer who did not want to.

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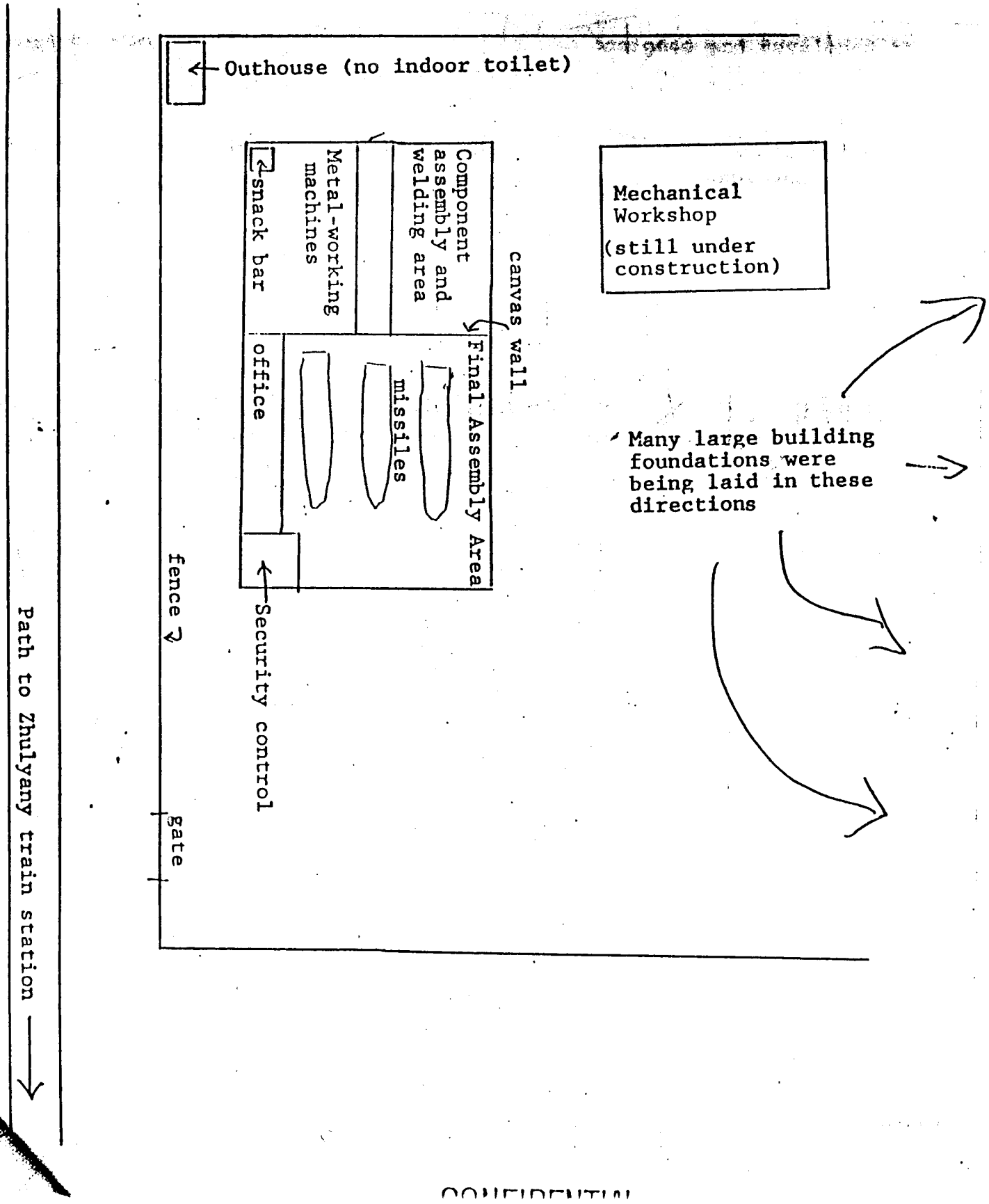
Figure 7, Layout of Zhulyany Branch Plant in 1969 (U)



9. (C) Transfer of Blueprints from Moscow: At about the same time, the end of 1967 or beginning of 1968, a team of of about five designers (including Source) from the new Zhulyany Plant traveled to Moscow on two trips of about three days each time to pick up all of the blueprints of the 5V61 from the Mechanical Plant. The blueprints were extremely numerous--there were boxes and boxes of them--and all of them had to be inventoried by this team before they were shipped by train to Zhulyany. This transfer of blueprints was significant, because with this act, the Mechanical Plant ceased to retain any responsibility for future modifications of the ABM--a responsibility that the Mechanical Plant did retain for the AAMs that the Artem Plant manufactured. (Originator's Comment: See paragraph 17 for a description of the role that the Mechanical Plant continued to play in modifications of AAMs.) The Zhulyany Plant, as the blueprint holder for the ABMs, would now play an analogous role, but the Grushin OKB would have to grant final approval for modifications. The blueprints were initially sent to the Artem Plant because the facilities of Zhulyany Plant were still incomplete, but would eventually be stored and used at Zhulyany.

10. (C) Security: The plant administration did not provide its employees with an explanation of what the 5V61 was and never even used the word "missile"--just the word "product" (izdeliye). For example, the workers who were manufacturing "Product 5V61" could conclude that this was a missile and not a widget only on the basis of their own observations and shared comments. No other terminology was used for the missile. (Originator's Comment: Source had never heard the words "Avoz" or "Aldad" used in relationship to any missiles.) All plant employees had security clearances--about 50% had third form, about 40% had second form, and about 10% had first form. Most employees (including Source) in the TsKB had second form clearances, but materials and information were provided only to people who had a need to use them. The secure library would check out a blueprint of a component only to an employee who was assigned to work on that component. For example, an employee in the TsKB electrical brigade could normally check out only blueprints that started with the letters "E1" (e.g. E1-1325), which designated an electrical component, and not blueprints that started with "R" (e.g. R-1325), which designated a radio component. In addition, the electrical and radio brigades worked in separate rooms controlled by separate combination locks. Each employee had to write all his notes in a special notebook with pre-numbered pages and had to turn in his notebook to the secure library at the end of every work day. However, security was not obviously stricter for the 5V61 than it was for the AAMs.

11. (C) Missile Description: Source visited the Zhulyany branch plant several times to examine the electrical section of the 5V61 missile as the missile lay in the final assembly area and also had several opportunities to glance at technical manuals that briefly described the system as a whole. From those experiences, he was able to draw the system (see below):

a. (C) Body: The missile was about 12 meters long and about 1.8 meters wide at the bottom (not counting the fins). (Originator's Comment: The dimensions that Source previously told another interviewer, who wrote the knowledgeability brief, were 11 meters long and 1.6 meters wide.) A small, hollow tube protruding from the tip of the nose (apparently a Pitot-static tube) was called the "entry part of air pressure" (priyemnaya chast vozdushnogo davleniya). The antennas built into the top set of fins were covered with a canvas material. (Originator's Comment: As far as Source knew, there was no additional booster stage for the missile.)

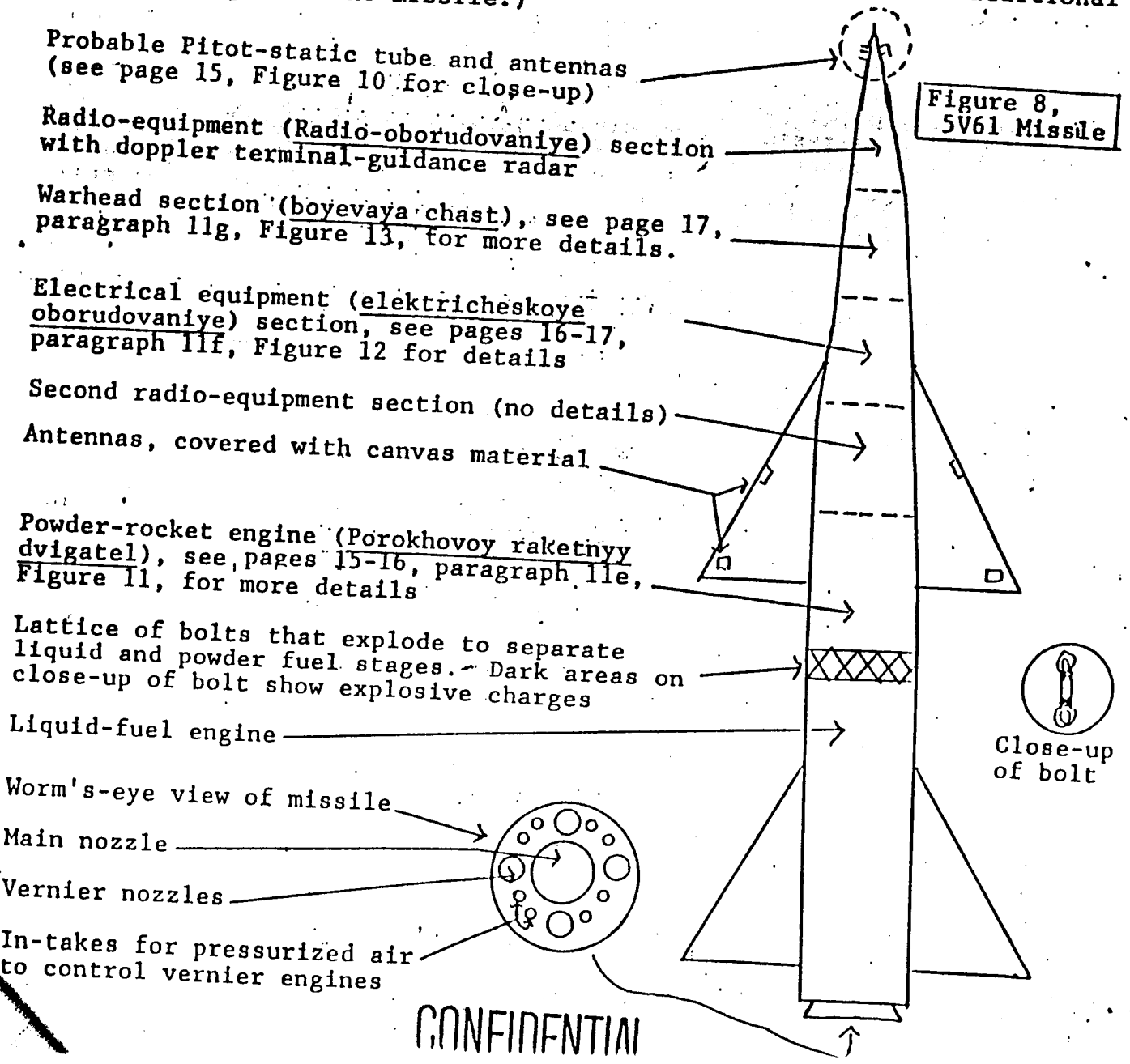


Figure 8, 5V61 Missile

b. (C) Deployment: The missile was to be transported in a cannister on the back of a large truck which was designed to hydraulically erect the missile. (Originator's Comment: Source only saw a picture of this truck and cannister, never the actual items. The interviewer didn't clarify whether the truck erected the missile onto the ground for launching or whether the truck actually launched the missile.)

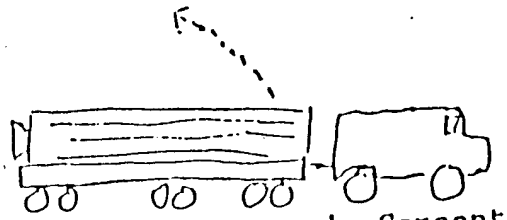


Figure 9, Source's Concept of 5V61 Transport-Erector (U)

c. (C) Tracking: After the missile took off, a ground-based guidance radar system tracked and guided the missile most of the way to the target. The optimum interception altitude was 180-200 kilometers. During the final part of the flight, a doppler radar system in the missile's nose cone turned on, illuminated the target, and provided terminal self guidance (samonavedeniye). About five antennas were built onto the nose of the missile (see Figure 10) and about four onto the upper fins (see Figure 8). (Originator's Comment: Source never saw the ground-based radar and knew no additional details about it. The interviewer asked Source to elaborate on the terminal guidance, but Source could not remember any details except that the system used the doppler method, a detail he provided without any prodding. The interviewer carefully and repeatedly asked whether Source was sure that the missile had a terminal guidance system, and he answered that he was. The interviewer did not clarify how Source had learned or guessed each of these details about the missile's altitude and guidance, but intends to do so during the next interview.)

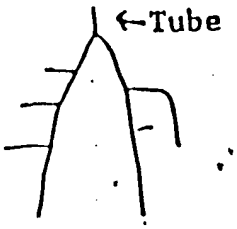


Figure10, Tube and Five Antennas on Nose Cone (U).

d. (C) Guidance: The bottom fins of the missile had control flaps that guided the missile in the atmosphere. In addition, the bottom stage of the missile was equipped with four vernier engines that guided the missile above the atmosphere. After this bottom stage separated, there was no apparent method of steering the missile, so Source concluded that the terminal guidance system turned on before then. (Originator's Comment: The interviewer did not determine whether the bottom stage had four fins 90 degrees apart or three fins 120 degrees apart. Source did not draw any control flaps on the upper set of fins that remained after the bottom stage separated, so it is not clear whether these fins might have had a steering function.)

e. (C) Propulsion: The propulsion system consisted of a liquid-fuel bottom stage and a solid-fuel top stage. One of the most difficult problems that the Zhulyany branch plant had in manufacturing the 5V61 was to properly weld the seams of the liquid-fuel tanks. The Mechanical Plant in Moscow had been able to weld them, but the welders in Zhulyany did not have the right equipment and skill to achieve the

same results. The top stage consisted of about 16 parallel powder charges (porokhovyye zaryady), each of which was a cylinder about two meters long and 10 centimeters thick. The two propulsion stages were connected by a metal lattice that exploded to separate the bottom, liquid-fuel stage. Then, the solid-fuel stage ignited to propel the missile the final distance to the target. (Originator's Comment: Source was not asked to explain why a solid-fuel stage would be placed above a liquid-fuel stage, and there may be some confusion on this point. The knowledgeablility brief on this Source, which was written by a different interviewer, says that there were eight "powder charges," each about 1.2 meters long and .25 meters thick, in the missile's warhead. However, the knowledgeability brief also said that the top propulsion stage was formally called the "powder rocket engine" (porokhovoy raketnyy dvigatel--PRD), and the sketch that Source drew for the interviewer who wrote this report clearly shows the powder charges right above the liquid-fuel engine and three sections below the warhead (see Figures 8 and 11). Source also mentioned to this interviewer that the powder charges were similar to a propulsion device he remembered seeing on the SA-2 (Sistema 75) when he worked with that system while on active military duty in the early 1960's. Finally, it may be of interest to mention that Source said to the other interviewer that the liquid-fuel engine had two fuel tanks, a detail he did not mention to this interviewer.)

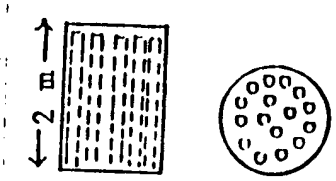


Figure 11, Side (Interior) and Bottom Views of Powder Charges in Powder Rocket Engine (U)

f. (C) Electrical Section: The electrical section included two large power blocks (bloki pitaniya), two regulators (regulyatory), and two sensor boxes (datchiki). Each of these were prepared products (gotovyye izdeliya), manufactured at some other plant and delivered in their casings. The Zhulyany Plant performed no internal modifications

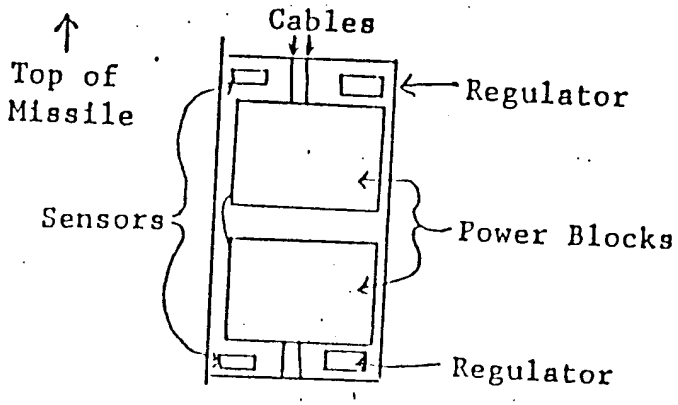


Figure 12, Electrical Section (U)

of these items, only external modifications such as different placement, cable hook-ups, or replacement of the items. (Originator's Comment: Although Source specialized in modifications of this section, he had never seen the insides of any of these items and did not know, for example, what characteristics the sensors measured.

g. (C) Warhead: The warhead inside the warhead section was a green cylinder about 1.2 meters long and 80 centimetes wide and covered with rows of bumps like a grenade. (Originator's Comment: The knowledgeability brief said that the entire warhead section was about 1.2 meters long and only 45 centimeters wide. See also paragraph 9d, above, for the KB's remarks about internal powder charges.) Some of the workers in the assembly area said that if the warhead had been red instead of green, then they would have earned more money, because such a warhead would be nuclear. However, it was not clear whether these remarks were informed or ignorant.

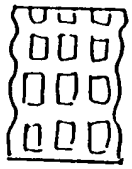


Figure 13, Grenade-like Warhead

12. (C) Initial Production: The Zhulyany branch's assigned production plan was to manufacture about three or four 5V61 missiles a month by the beginning of 1969, despite the problem that the plant itself was still being built. In fact, only two of many planned buildings had been erected by the end of 1969, and many of the walls were still simply canvas hangings. There were also many difficult manufacturing problems, especially the problem of welding the liquid-fuel tanks. Therefore, the plant only completed four or five missiles during the entire period of 1968-69, and those were all declared to be defective by military representatives. However, in order for the plant to receive money for at least some production, the Ministry of Defense agreed to accept the defective missiles as training (uchebnyye) models. When the first missile was complete, Petr Grushin and Petr SHELEST, Politburo member and First Secretary of the Ukrainian Party, both came together to inspect the plant and missile and to participate in a congratulatory ceremony. (Originator's Comment: According to the knowledgeability brief, Source previously said that a total of six missiles were manufactured. It will be necessary to establish Source's certainty about this number in the next interview.)

13. (C) 5V63 Modification: By autumn 1969, the Grushin OKB had developed and the Mechanical Plant had manufactured a modification of the 5V61 called the 5V63. A prototype 5V63 missile was test launched in 1969 from a launch site at [redacted] This launch was rumored to be a failure, but the administration of the Zhulyany branch nevertheless understood that it would eventually manufacture this modification. The 5V63 had a higher altitude, 200-220 kilometers, and had some technological innovations. (Originator's Comment: Source heard about this from his supervisor, who was trying to talk Source out of leaving the plant to take another job in 1969. The supervisor hoped to convince Source that the plant had a bright future and and that Source would have the opportunity to

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work with the most modern technology. Since Source's knowledge of this modification is based solely on this short conversation, he cannot provide additional details on this subject.)

14. (C) Post-1969 Production: According to remarks made by employees who continued to work at the Artem and Zhulyany plants, the problems in manufacturing the ABM missiles were solved by 1970 or 1971, and production was proceeding at a smooth rate. (Originator's Comment: Source is fairly certain that the Zhulyany Plant had begun to manufacture the 5V63 modification by this time.) However, in about 1971 or 1972, a political decision was made to stop production completely and forever. Even the construction of the plant, which was almost finished, was halted. This news came as a shock to the employees of the Zhulyany branch plant, many of whom had left comfortable jobs elsewhere to transfer to this new plant in hopes of career advancement. In fact, the plant had no alternate product at all, and the employees were worried that they would soon find themselves without any income. Since the Ministry of Aviation Industry could not provide any sure information about the plant's future, the plant administration took the initiative to look around itself for any new products to manufacture instead of the missiles. The administration even went so far as to enter formal negotiations with a plant in Vasilkov to help manufacture civilian refrigerators that that plant produced. (Originator's Comment: Source said that Vasilkov is a town about 40 kilometers from Kiev, but it is not listed in available gazetteers.) However, about six months after the Zhulyany Plant received its orders to cease production of the ABMs, it received new orders that completely overturned the previous orders. Now, the plant was supposed to finish construction of its facilities and resume the previously planned production. According to subsequent remarks made by plant employees, the plant finished its facilities, resumed production, and continued to manufacture the missiles into the 1980's. (Originator's Comment: The information in this paragraph is based on casual conversations that Source had with his former colleagues at the plant when he ran into them around Kiev. He did not question his colleagues with much interest or in any detail about these developments, so he considers his understanding of this subject to be rather sketchy. He also had the impression that the Zhulyany branch plant had grown to about twice the size of the parent Artem plant and therefore must have had a labor force of about 10,000 workers.)

15. (C) ABM or SAM?: Source had never heard authoritatively that the 5V61/63 was an ABM--instead of a surface-to-air missile (SAM) primarily for use against airplanes--but nevertheless reached this conclusion based on the following considerations:

a. (C) He had served as a career officer in a System 75 (SA-2) battalion during the early 1960's and knew that this missile's altitude on the order of 200 kilometers was much higher than that of ordinary SAMs. At that time, he knew that the highest altitude SAM was the

System 200 (SA-5), which he had seen launched during a live-fire exercise at Kapustin Yar. The 5V61 was much bigger than the missile of the System 200 and was therefore a obviously in a different class.

b. (C) The fact that Shelest, a Politburo member, came to the plant for the ceremony in honor of the first missile indicated that this missile must have a national, strategic importance.

c. (C) The decision to halt the production of the missile was definitely associated in time with the SALT-1 negotiations, although the significance of this association was not clear. Source could not remember for sure whether the production halt was just before, during, or after the treaty, but he was certain that it was close to the same time. He also could not remember what year the treaty was signed, but he thought that the production halt was in about 1971 and that the treaty was signed in about the same year. He speculated that the Soviets halted production for six months after the treaty to fool the US government but then resumed it as a secret violation of the treaty. In fact, the treaty was signed in 1972, so it is not clear whether the production halt was in 1971, before the treaty, or in 1972, after the treaty.

Missile Modification Procedures

16. (C) Initiation of Modifications: The great majority of modifications for any AAMs in series production originated as suggestions or complaints from military units using the missiles. The design bureau or the manufacturing plant proposed a much smaller proportion of the modifications, but often took credit for modifications originally proposed by military units. About 10% of the modifications genuinely originated at the plant. A military unit making a suggestion or complaint would address it to the Operations Maintenance Department (Eksploatatsionno-remontnyy otdel--ERO) of the plant that had supplied the missile. Although this department was subordinate to the plant, it consisted primarily of active-duty military officers. They traveled around to the military units using the missile and helped them with any operations or maintenance problems that the units were having with the missiles. (Source Comment: Although ERO duty was hardly considered a hardship assignment, the ERO members of the Artem Plant took great pride in their recent combat exploits. According to their story, a couple of the ERO members had been working with Egyptian military units when the 1967 War broke out. The Egyptians retreated in panic from the Israeli attack and abandoned a lot of Soviet AAMs. However, the heroic Soviet ERO members sneaked through the lines and managed to retrieve the missiles before the Israelis could capture them.)

17. (C) Modification Authority: The ERO was subordinate to the plant's chief engineer and would therefore refer the complaints or suggestions to him. If the proposal involved a very simple manufacturing change, he might prepare the proposal in some technical detail, but most proposals involved some operational functions that were beyond his staff's competence to properly evaluate. Therefore, he usually sent

the proposal in its rough form to the Mechanical Plant, which was the minimal level of authority to approve any modification. If the proposal involved a modification that did not change the operational capability of the missile, the Mechanical Plant could approve the modification itself, but any functional modification required the approval of Grushin's OKB. Most proposals did go all the way to the OKB. In either case, however, the Mechanical Plant and Grushin's OKB were usually too busy with their current missile projects to actually make the modification, so the approving authority would send the approved proposal back down to the manufacturing plant's TsKB with a deadline for accomplishing the modification. The head of the TsKB would assign the modification down the chain of command to the appropriate section (KB-1, 2, 3, or 4; see Figure 5), and the section would assign it to the appropriate brigade, and the brigade head would assign it to a specific designer (konstruktor), who then became personally responsible for accomplishing the modification by the deadline.

18. (C) Blueprint Change Sheet: The designer usually received the modification proposal in a very rough form. For example, it was common to receive a simple piece of paper that would say something like, "replace the big box shown on blueprint E1-1325, sheet 2, with two boxes, each half the size and weight of the large box, and maintain the center of gravity." The purpose of the change was often neither explained nor obvious. A typical deadline was about one month from the time that the engineer had received his instructions. The designer would then go to the secure library, check out the blueprint, and perhaps then go to the workshop where that part of the missile was assembled and look at the actual parts. Then, the designer would decide how to make the change and would draw the new arrangement on a special form called a Blueprint Change Sheet (Listok izmeneniya chertezha--LICh). If several variants were possible, he might prepare a separate LICh for each of them so that he could still meet the deadline if his first proposal were rejected. This technical analysis and drawing of the modification was usually the easiest part of the process and typically took only about a week.

19. (C) Coordination: The most difficult and time-consuming part of the modification process was to coordinate the modification with all the appropriate authorities at the manufacturing plant. At the bottom of the LICh, under a large blank space where the designer drew his modification, was a large section of blocks where coordinating authorities would sign their initials when they had approved the change. At a minimum, the modification had to be coordinated with the designer's brigade chief, section chief, the TsKB chief, and the Chief Engineer. Depending on the modification, it might also have to be coordinated with, for example, the chief of the supply section, the chief of the stamping section, and the chief of the ERO. The designer had to use his own good judgement in determining who the modification should be coordinated with, and the Chief Engineer would not initial the change if he himself didn't believe it had been coordinated with all the necessary authorities. The main difficulty in coordinating

with all these official was not to convince them that the modification was a good one but simply to get a few minutes of their time to show them the proposal and get them to initial the form. These officials were out of their offices too much or too busy to be very accessible. As a result, this part of the process typically took about two weeks.

20. (C) Final Approval: After everybody else had initialed the LICh, the Chief Engineer would initial it and send it to the Mechanical Plant. Usually, the Mechanical Plant would approve the modification on its own authority, without refering the LICh to the Grushin OKB. If the Mechanical Plant did approve the modification, it attached the modification to the original blueprint, and the modification became official on the day of the assigned deadline. The importance of the deadline came from the need to have the modification become official in many places at once--at the Mechanical Plant, at the manufacturing plant, and possibly for military units where the missile was used. The ERO would notify these units in advance that the change was imminent.

Miscellaneous Plant Information

21. (C) Plan Fulfillment: The Artem Plant (not counting the Zhulyany branch in 1968-69) practically always fulfilled its production plan, but did not always receive its deserved bonuses, because of overall problems in the region's economy. For example, Kiev's retail organizations would often fail their sales plans, so the Kiev government would arbitrarily reallocate some of the bonus money from plants like the Artem Plant to the retail organizations to spread the misery around a little more evenly. At least, that was common opinion of most workers at the Artem Plant, and they therefore felt that they were regularily cheated out of their due reward for fulfilling their own plan. (Originator's Comment: Source was asked how the production plan for the TsKB was expressed. He generally remembered that the plan was expressed in several categories, like total modifications accomplished, self-initiated modifications accomplished, money saved, percentage of deadlines met, and so on. However, he could not remember any detailed examples and considered this topic of discussion to be unimportant. In his opinion, the production plan for the design bureau was a paper exercise in which the bureau's administration could almost always choose the most favorable criteria and interpret the numbers willfully to always demonstrate that the plan had been fulfilled. He also felt that the local government's ease in reallocating bonus money was an indication that this attitude pervaded the entire Soviet system.)

22. (C) Work Load: The Artem Plant easily had enough employees to handle the normal work load. For example, the Electrical Brigade of the TsKB had about 25 designers to just do modifications of the electrical systems of the four kinds of aircraft missiles that the plant manufactured. Because of leaves and other assignments, probably only about 20 of the designers were normally at work at any given time, but even this was excessive. Five designers could have actually done

this brigade's work if they worked efficiently. As a result of this excess manning, the employees goofed off a lot and worked at an easy pace.

23. (C) Pay: Basic pay for engineers (designers) was about 145 rubles a month, for senior engineers about 180 rubles a month, and for workers about 250-350 rubles a month. About ten months every year, these basic salaries were supplemented with a bonus of about 30% for fulfilling the plan, although the plan was actually fullfilled practically every month. Fringe benefits for employees included a medical clinic at the plant and recreation center in the town of Pirnovo (coordinates not listed in available gazetteers). In addition, the plant had an apartment complex for employees, but the waiting list for an apartment there was about seven years.

24. (C) Level of Technology: The level of technology at the Artem Plant could be described as "high, modern, and adequate," but certainly not state-of-the-art. Another way to describe the technology was that the technology of the product--the missiles--was definitely higher than the technology of the manufacturing process. The manufacturing technology was therefore the most important constraint in improving the technology of the product. The most primitive manufacturing technology was in the areas of the plant that did the primary shaping of materials--such as the shops that forged or stamped metal or made rubber linings. Some of these shops looked almost like garage workshops, and the workers there did a lot of manual labor. However, the workshops farther in the production or assembly process were obviously more modern. There was no foreign equipment (remembered by Source) except for an East German blueprint copier. The difference between the manufacturing technology at the Artem Plant and its Zhulyany branch plant was "like night and day." The new plant was much more modern. Neither plant seemed to be directly associated with any research institutes. (Originator's Comment: Source can comment in more detail on particular technologies associated with the missiles' electrical sytems.)

25. (C) Missile Shipments: The aircraft missiles that the Artem Plant manufactured were assembled in the top stories of a building (see Figure 3 on page 6) and stored there in boxes until ready for shipment. All these boxes were picked up and hauled away by trucks at night. Sometimes, as the workers were leaving work in the evening, they would see that an enormous pile of these boxes--piled higher than a man could reach--had suddenly appeared in the courtyard in front of the assembly building. When the workers returned to work early the next morning, all of these boxes would be gone.

26. (C) Civil Defense: Civil defense training was primarily limited to occasional games to compete in first-aid and chemical-protection drills. The plant did not seem to have a systematic instructional program, nor an underground shelter. Source thought that the plant must have some kind of wartime warehouses and an evacuation site, but he had no ideas where these were.