1

Mikhail Yangel: The Father of Yuzhnoye

1.1. Mikhail Kuzmich Yangel

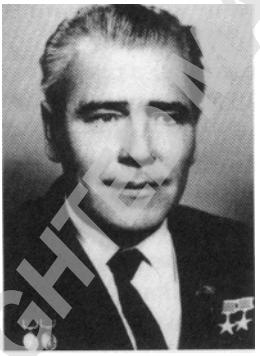


Figure 1.1. *Mikhail Kuzmich Yangel (source: rights reserved)*

Mikhail Kuzmich Yangel was born on October 25, 1911 (Julian calendar) or November 7, 1911 (Gregorian calendar) in the village of Zyryanova in the Nizhny–Ilimskyi region, near Irkutsk (Siberia). His parents, Kuzma Lavrentiyevich and Anna Pavlovna, were peasants. They had 12 children (eight boys and four girls): Nikolai (1900–1962, made his career in the army), Kirill (1901, died at a few months old), Aleksandr (1903–1974, Major General of the NKVD), Konstantin (1907–1938, educated at the School of Mines, arrested and executed in 1938), Nadezhda (1907–1932), Mikhail (1911–1971), Galina (1913–1945), Zoya (1915–1923), Pavel (1917–1970), Georgy (1921–1972), Valentina (1923–?) and Yakov (1926–1988).

For a color version of all figures in this chapter, see www.iste.co.uk/lardier/yuzhnoye.zip.

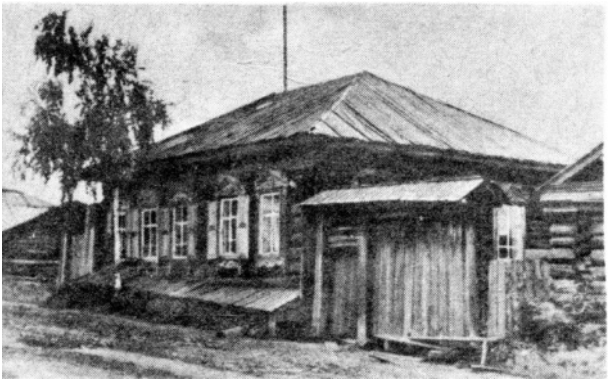


Figure 1.2. *The Yangel house in Zyryanova (source: rights reserved)*

Mikhail joined the Komsomol (Communist youth organization) in 1925. The following year, at the age of 15, he moved to Moscow to join his brother Konstantin. He attended the Krasnoarmeysk Textile Factory School near Moscow, and then worked in the factory of a workshop. In July 1931, he joined the Communist Party of the Soviet Union (CPSU). In September, he joined the newly established Moscow Aviation Institute (MAI), but we do not know whether he had a passion for aviation prior to joining the Institute.

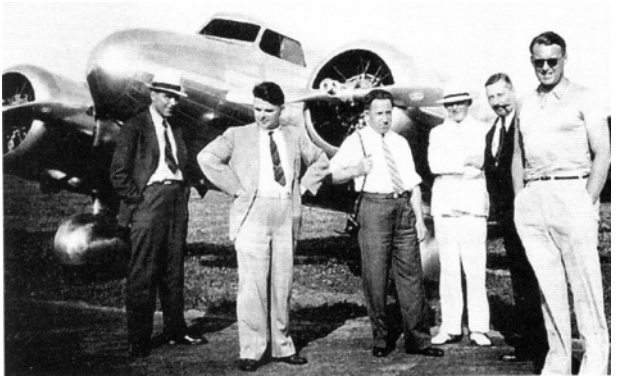


Figure 1.3. *Yangel in the United States in 1938 (source: rights reserved)*

He soon became a member of the Party Committee and then Secretary of the Komsomol Committee of the Institute. There he attended the courses of the famous Aircraft Designer, N.N. Polikarpov. In September 1935, he became a Second-Category Designer at the Polikarpov Design Bureau (OKB) to complete his

thesis project, “High-Altitude Fighter with a Pressurized Cabin”. After graduating in January 1937, he joined the Wings Brigade of the OKB where he worked on modifications to the I-15 and I-16 fighters, notably the I-153 Chaika, which were widely used during the Spanish War.

From February to September 1938, he was part of a Soviet delegation that traveled to the United States within the framework of the US-Soviet trade agreements. He resided on 5th Avenue in New York and visited several aviation plants in Chicago (Boeing), Los Angeles (Lockheed), Santa Monica (Douglas), San Diego (Consolidated Vultee Aircraft Corp), etc. On his return, in November, he was appointed Deputy to Polikarpov.

On May 23, 1939, he married Irina Viktorovna Strazheva (1915–1995) who had been studying at MAI since 1935. In 1940, she became an engineer at the Flight Research Institute (LII). A specialist in aerodynamics, she taught at MAI and went on to become a Doctor of Technical Sciences. She bore Mikhail two children: Ludmilla (1940–2021) and Aleksandr (1942–1989). They both graduated from MAI, Aleksandr to work as a journalist, and Ludmilla to become a Doctor of Technical Sciences and a professor.

Figure 1.4. *Wedding to Irina in 1939*
(source: rights reserved)

After his wedding, Yangel then moved to Gorky Plant No. 21 to organize the serial production of the I-180 fighter. It was onboard this plane that the famous pilot V.P. Chkalov was killed on December 15, 1938. In April 1940, Yangel returned to

become Lead Engineer of the heavy escort fighter TIS (A). It was an aircraft of 8.9 t max on take-off, equipped with two AM-37 engines. It was set to be produced by Moscow Plant No. 51, and in July he was appointed Deputy Plant Director and Lead Engineer at the OKB. However, the war then began on June 22, 1941. The first flight of the TIS (A) was conducted by the test pilot G.M. Shyanov on August 30th. He then organized the evacuation of the plant in Novosibirsk in November. On June 13, 1942, the TIS (A) was entrusted to A.V. Potopalov and Yangel returned to Moscow. He became Head of an assembly shop in a plant, then Deputy Head of the flight test station on December 5th. On January 16, 1943, he rejoined the Polikarpov OKB. Yangel then organized the repatriation of the plant and the serial production of the I-185 fighter. However, on April 5th, the pilot V.A. Stepanchenok died during a test flight of this aircraft, which ultimately did not get serially produced.

Figure 1.5. *The Yangel family (source: rights reserved)*

In February 1944, Yangel returned to Moscow and the following month, he became Deputy Main Engineer at OKB-155 of A.I. Mikoyan for nine months. Shortly thereafter, on July 30th, Polikarpov died of stomach cancer. His OKB-51 was then entrusted to V.N. Chelomei for the development of the Soviet V-1: the 10Kh missile. In February 1953, the OKB was withdrawn from him and was entrusted to Mikoyan. It became the subsidiary for winged rockets, headed by M.I. Gurevich. Stalin died on March 5th. In October, the subsidiary was withdrawn from Mikoyan to merge with OKB-1 of P.O. Sukhoi. This OKB had been created to produce a model of the American F-86 Sabre from a copy recovered in Korea in May 1952. It was initially headed by V.V. Kondratiyev, and then by Sukhoi from May 1953. On January 15, 1954, it formed the new OKB-51 to develop the S-1 (swept wing) and T-1 (delta wing) fighters.

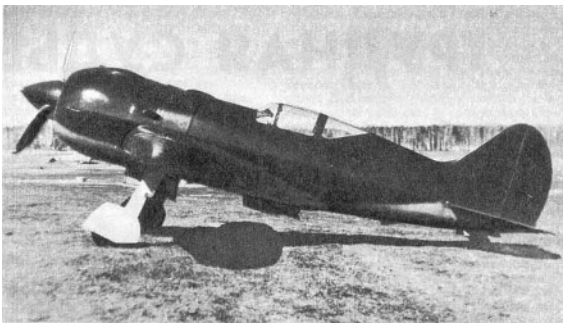


Figure 1.6. *The I-185 aircraft of 1943 (source: rights reserved)*

In January 1945, Yangel became Lead Engineer of the VB-109 aircraft in OKB-482 of V.M. Myasishchev in Moscow (for 1 year). But the OKB closed. In January 1946, he became Lead Engineer in a Sector of the Ministry of Aviation Industry for (two years), which was working on a new technique. Indeed, this was the beginning of jet aviation. From early 1948 to March 1950, he studied at the Academy of Aviation Industry (for two years) in Moscow. His degree was in the calculation of a fighter wing. At the Academy, he met S.O. Okhapkin, who, having graduated from MAI in 1938, had worked in the OKBs of Tupolev, Myasishchev and Ilyushin. They were the only two of their year group to enter the rocket industry. On April 12, 1950, Yangel became Head of Sector No. 5 (Guidance Systems) at OKB-1 of NII-88 headed by Sergei Korolev. He replaced Boris Chertok, who became his Deputy (Chertok was Jewish and victim of Stalinist cosmopolitanism) because Yangel had no experience with guidance systems and rockets. Korolev explained to Chertok that he would deal directly with him because Yangel was to be with them for a long time. Okhapkin was Head of the Strength Section.

On March 24, 1951, Myasishchev's OKB reopened: it became OKB-23, in charge of building a strategic jet bomber (aircraft 25, M4). He requested the return of Yangel and Okhapkin to his Design Bureau. But ultimately, they stayed with Korolev.

On May 9, 1951, production of the R-1 was entrusted to Plant No. 586 in Dnepropetrovsk (Ukraine). A team from OKB-1, headed by V.S. Budnik, Head of Sector No. 4 (Construction), visited the site, where he created a Serial Production Design Bureau (SKB). Budnik was then replaced by Okhapkin.

On July 31, 1951, Yangel was appointed Korolev's Deputy Chief Designer. At this time, the OKB was developing the R-5 and R-11 ballistic missiles. The first was oxygen/kerosene (non-storable) and the second was nitric acid/kerosene (storable).

Figure 1.7. *Korolev's R-11 missile*
(source: rights reserved)

On March 20, 1952, three rocket-engine Design Bureaus were formed: OKB-1 of L.S. Dushkin at NII-1, OKB-2 of A.M. Isayev and OKB-3 of D.D. Sevruk at NII-88.

On May 16, 1952, Yangel took over the management of NII-88, replacing K.N. Rudnev, who became Deputy Minister of Armaments. He then rose above Korolev, having only been at the Institute for two years. But he was a communist who was supported by Minister D.F. Ustinov while Korolev was imprisoned in 1938–1944 and was not yet at the CPSU (he was not until one year later). Yangel's predecessors were Directors of arms plants: L.R. Gonor, Director in 1946–1950, had headed Gun Plants (Barricade, UralMash and Bolshevik), while K.N. Rudnev, Director in 1950–1952, had headed TsKB-14 in Tula and NII-61 in Klimovsk (Firearms).

Yangel headed NII-88 for 18 months. But during this period, important Decree No. 443-213ss: "On the Plan of Scientific-Research Work on Long-Range Rockets in 1953–1955" was issued by Stalin on February 13, 1953, providing for the creation of an intercontinental missile.

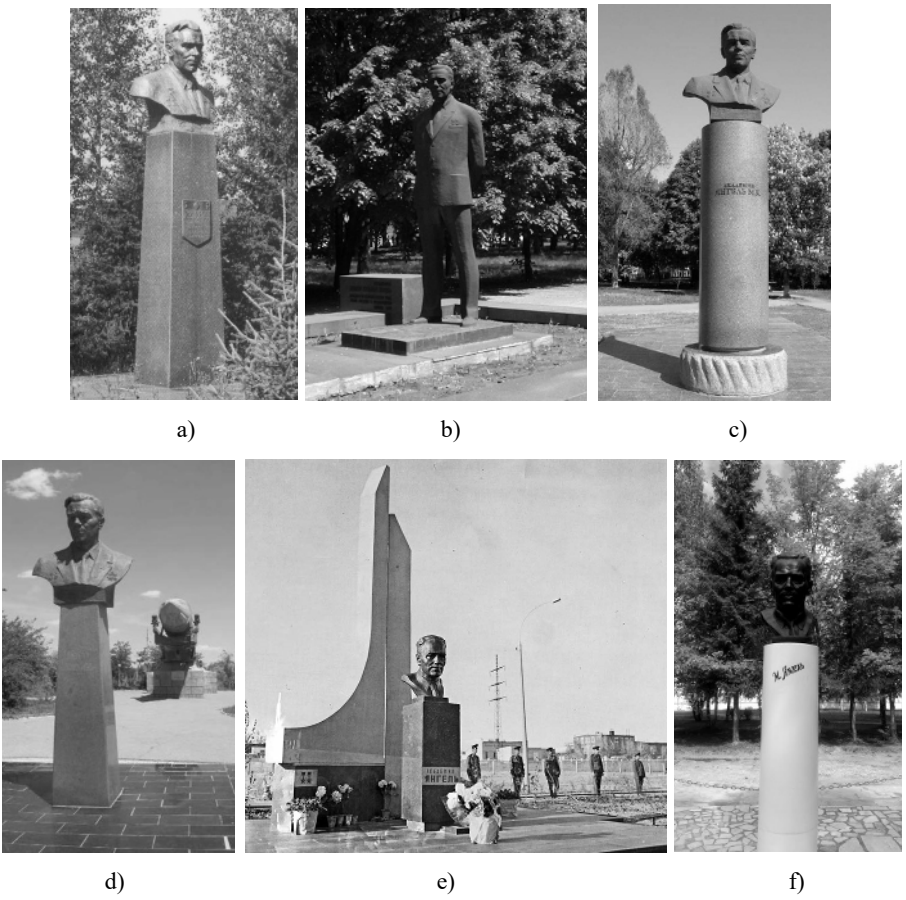
On October 30, 1953, Yangel became Main Engineer at NII-88 following his replacement by A.S. Spiridonov. The latter had been Main Engineer at the Institute in 1948–1949, then Head of the 7th Glavka for six months, then Head of the 6th Glavka of the Ministry in 1949–1953. Yangel's predecessor was M.S. Ryazanskyi was Chief Designer at NII-885 in May 1946, Main Engineer at NII-88 in January 1951, then Head of the 7th Glavka of the Ministry in June 1952.

In order to develop storable propellant rockets and create a competitor to Korolev, the government decided to form a new OKB in Dnepropetrovsk. Thus, the Budnik SKB was transformed into OKB-586 by Decree No. 674-292 of April 10,

1954. And on July 9th, Yangel was appointed its Head and its Chief Designer. This marked the end of Korolev's monopoly. Yangel directed this organization for 17 years. He was twice awarded the Hero of Socialist Labor Medal in July 1959 for R-12, and in June 1961 for R-14, the Lenin Prize in April 1960 for R-12, the State Prize in 1967 for R-36, four "Orders of Lenin" in 1956 (R-5M), in 1959 (Hero), in October 1961 for his 50 years and in 1969 (8K69/R-36Orb), the Order of the October Revolution in April 1971 and the Korolev Gold Medal of the Academy of Sciences in 1970.

Figure 1.8. *Awarding of the Hero of Socialist Labor Medal in June 1961: from left to right, V.P. Finogenov,?, K.N. Rudnev, V.P Glushko, V.I. Kuznetsov, D.F. Ustinov, L.I. Brezhnev, M.K. Yangel, M.P. Geogradze, N.A. Pilyugin,? (source: rights reserved)*

He was a Doctor of Technical Sciences in 1960, Professor at the University of Dnepropetrovsk, Academician of Ukraine in 1961, then Academician of USSR in 1966. He was elected Deputy of the city of Kaliningrad (now Korolev) in 1952–1954, then Deputy to the Supreme Soviet in 1966–1971. Lastly, he was a candidate for the CPSU Central Committee at the 1966 Congress, but was not elected as a Member of the Congress of 1971 (March 30 to April 9, 1971). He died of a fifth heart attack on his 60th birthday, October 25, 1971. Like Yangel, Korolev also died at the age of 60, on January 14, 1966 during surgery that went wrong. He is buried in Novodevichy Cemetery in Moscow. Busts of Yangel are found in his native village (Siberia), at his company based in Dnepropetrovsk, in Baikonur and in Plesetsk.



a) b) c)

d) e) f)

Figure 1.9. *Monuments to Yangel: a) native village in Siberia; b) OKB-586/Yuzhnoye; c) Yangel Street in Dnipro; d) in Leninsk-Baikonur; e) Zone No. 43; and f) in Mirny-Plesetsk (source: rights reserved)*

1.2. The Dnepropetrovsk Plant

For serial production of the 8A11/R-1, it was first decided to use Artillery Plant No. 385 of Zlatust in the Urals (Decree of December 14, 1947). It was headed by N.P. Poletayev (1905–1990). In 1949, Korolev sent his Deputy, A.Y. Sherbakov (1901–1978) to open a Production Bureau that studied the 50R and 50RA versions. But by October 1950, nothing had yet come to fruition and production of the R-1

was transferred elsewhere. For its part, Plant No. 385 made Isayev engines in 1951, the 8B51 missile from Sevruk in 1952, then the R-11 from Korolev from 1953. The second site studied was in Kiev, but Minister Ustinov refused to place such a strategic plant in the capital of Ukraine. Lastly, the YuzhMash Plant No. 586 in Dnepropetrovsk was chosen. It was an automobile plant (DAZ) that became the largest rocket production plant in the world.

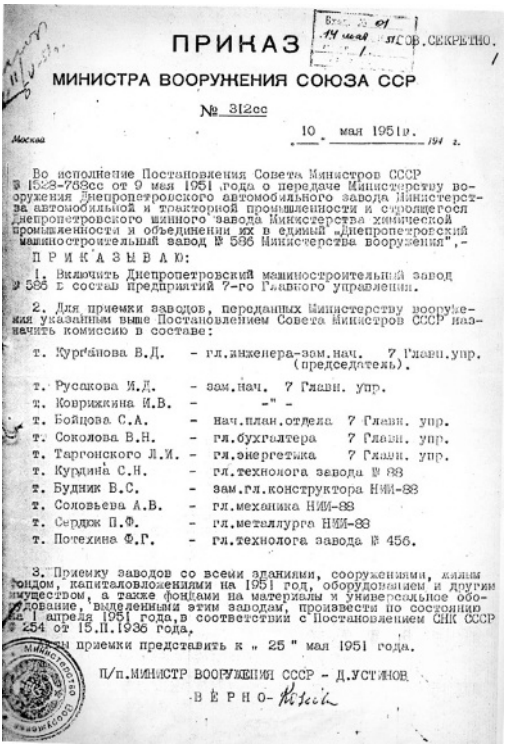
This plant was established on July 21, 1944 after the withdrawal of the Germans. Initially, it produced Gorky (GAZ) automobile plant vehicles. In August, the Minister of Medium Machine Building[1] S.A. Akopov appointed V.A. Grachev as Chief Designer. In 1950, G.M. Grigoriyev was appointed Plant Director and the Head of Production was A.M. Makarov. The Plant was then awarded a Stalin Prize (Grigoriyev, Grachev, etc.). When Ustinov decided to move the plant into rocket production, Minister Akopov opposed it. But Stalin said: "if we have rockets, we will make trucks, but if we do not have rockets, we will no longer have trucks".

On May 9, 1951, Decree No. 1528-768 "On the Merging of DAZ of the Ministry of Automobile and Tractor Industry and the Tire Plant of the Ministry of Chemical Industry into Machine-Building Plant No. 586 of the Ministry of Armaments" was signed by the Government. It was made secret and its address was "P.O. Box No. 186". At that time, it had more than 8,700 employees. The next day, the Ministry issued Order No. 312ss appointing an Implementation Commission: this comprised six people from the 7th Glavka (Rockets), four from NII-88 (S.N. Kurdin, V.S. Budnik, A.V. Soloviyev and P.F. Serdyuk) and one from OKB-456 (F.G. Potekhin). Then Order No. 380 of June 1, 1951 established the organization of the serial production of R-1. Initially, the objective was to make 70 units in 1951, 230 in 1952, 700 in 1953, then 2,500 from 1954. The first R-1 of Dnepropetrovsk flew in November 1952. Nikita Khrushchev came to say that it produced rockets "like sausages".

On November 30, 1951, an order from Ustinov decided on the organization of the serial production of 8J38/R-2 with its RD-101 engine at Plant No. 586. On August 31, 1952, the order was given to produce the Lavochkin V-303 surface-to-air missile (S-25 Berkut system) with its S09-29 engine. On November 13, 1954, the Central Committee indicated that only 61% of R-1 production had been achieved and only 39% of R-2 production. In 1955, the production of R-1 was replaced by that of 8K51/R-5 and 8K51M/R-5M. On June 20, 1955, the production plan for 1956–1960 aimed for the production of 330 R-5Ms (50 in 1956, 80 in 1957, 100 in

1 Became the Ministry of Automobile Industry on February 17, 1946, then of Automobile and Tractor Industry on August 23, 1947.

1958 and 100 in 1959). In addition, a second plant in the Urals had to produce 1,000 rockets/year from 1961, but this project was abandoned. On April 20, 1956, decorations were awarded for R-5M: M.K. Yangel and L.L. Yagdzhiyev were awarded the Order of Lenin; V.S. Budnik, I.I. Ivanov, F.F. Falunin, L.V. Smirnov, A.M. Makarov and N.D. Khokhlov were awarded the Order of the Red Banner of Labor. In 1968, 628 rockets were deployed in regiments. Lastly, Plant No. 586 supplied OKB-1 with R-5s for geophysical launches from 1958 to 1971.



ПРИКАЗ

МИНИСТРА ВООРУЖЕНИЯ СОЮЗА ССР

№ 312сс

Москва 10 мая 1951 г.

Во исполнение Постановления Совета Министров СССР № 1528-768сс от 9 мая 1951 года о передаче Министерству вооружения Днепропетровского автомобильного завода Министерства автомобильной и тракторной промышленности и сооружаемого Днепропетровского машинного завода Министерства химической промышленности и объединении их в единый "Днепропетровский машиностроительный завод № 586 Министерства вооружения",-

ПРИКАЗЫВАЮ:

1. Включить Днепропетровский машиностроительный завод № 586 в состав предприятий 7-го Главного управления.

2. Для приемки заводов, переданных Министерству вооружения указанным выше Постановлением Совета Министров СССР назначить комиссию в составе:

т. Кургинова В.Д. - гл.инженера-зам.нач. 7 Главн.упр. (председатель).
т. Русакова И.Д. - зам.нач. 7 Главн. упр.
т. Коврижкина И.В. - -"-
т. Бойцова С.А. - нач.план.отдела 7 Главн. упр.
т. Соколова В.Н. - гл.бухгалтера 7 Главн. упр.
т. Таргонского Л.И. - гл.энергетика 7 Главн. упр.
т. Курдина С.Н. - гл.технолога завода № 88
т. Будник В.С. - зам.гл.конструктора НИИ-88
т. Соловьева А.В. - гл.механика НИИ-88
т. Сердюк П.Ф. - гл.металлурга НИИ-88
т. Потехина Ф.Г. - гл.технолога завода № 456.

3. Приемку заводов со всеми зданиями, сооружениями, живым фондом, капиталовложениями на 1951 год, оборудованием и другим имуществом, а также фондами на материалы и универсальное оборудование, выделенными этим заводам, произвести по состоянию на 1 апреля 1951 года, в соответствии с Постановлением СНК СССР № 254 от 15.II.1936 года,

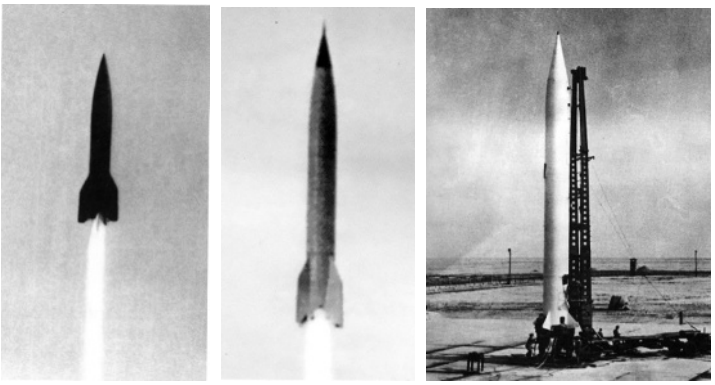
Акты приемки представить к " 25 " мая 1951 года.

П/п.МИНИСТР ВООРУЖЕНИЯ СССР - Д.УСТИНОВ

ВЕРНО-

Figure 1.10. *Order of May 10, 1951 (source: rights reserved)*

In the 1980s, the Plant employed 53,600 people and produced up to 100 rockets/year, on average 18 satellites/year and up to 62,000 tractors/year. After the end of the USSR in 1991, it ceased to produce military missiles. As part of the conversion, it started the production of buses, trolleys, chassis for Antonov aircraft (An-140, An-148, An-158, etc.), wind turbines, etc. The workforce fell to 30,000, then to 20,000 in 1999, then to 16,500 in 2005 and then to 7,000 in 2014.



a) b) c)

Figure 1.11. *a) The first R-1 of Plant No. 586 launched in November 1952; b) the first R-2 of Plant No. 586 launched in May 1954; and c) the R-5M produced at Plant No. 586 in 1956 (source: rights reserved)*

Постановление Центрального Комитета КПСС, Президиума Верховного Совета СССР и Совета Министров СССР

Об увековечении памяти Леонида Ильича Брежнева

Учитывая исторические заслуги верного продолжателя великого дела Ленина, выдающегося деятеля Коммунистической партии и Советского государства, международного коммунистического и рабочего движения, пламенного борца за мир и коммунизм Леонида Ильича Брежнева и в целях увековечения его памяти, Центральный Комитет КПСС, Президиум Верховного Совета СССР и Совет Министров СССР постановляют:

1. Переименовать:

город Набережные Челны в город Брежнев;

Черемушкинский район города Москвы в Брежневский район;

Заводский район города Днепродзержинска в Брежневский район.

2. Присвоить имя Л. И. Брежнева:

Оскольскому электрометаллургическому комбинату;

производственному объединению «Южный машиностроительный завод»;

Новороссийскому цементному комбинату;

Волго - Донскому производственному объединению «Атоммаш» атомного энергетического машиностроения;

Нурекской ГЭС, Таджикская ССР;

Целинному совхозу Кустанайской области;

колхозу «Вяца-ноуэ» Оргеевского района Молдавской ССР;

Днепропетровскому ордена Трудового Красного Знамени металлургическому институту;

Звездному городку (Московская область);

атомному ледоколу «Арктика»;

высшему военному училищу Министерства обороны;

учебной танковой дивизии, где служил Л. И. Брежнев;

средней школе № 1 города Днепродзержинска;

по одной новой площади в городах Москве, Ленинграде, Киеве, Алма-Ате и Днепропетровске;

кораблю Военно-Морского Флота;

морскому пассажирскому судну.

3. Установить 12 стипендий имени Л. И. Брежнева для студентов МГУ им. Ломоносова, Днепропетровского металлургического института им. Л. И. Брежнева и Днепродзержинского индустриального института им. Арсеничева.

4. Установить мемориальные памятные доски на Днепровском металлургическом заводе им. Дзержинского, где работал Л. И. Брежнев, на здании Днепродзержинского индустриального института им. Арсеничева, где он учился, и на доме № 26 по Кутузовскому проспекту в городе Москве, где он жил.

5. Установить бюст на могиле Л. И. Брежнева на Красной площади у Кремлевской стены.

ЦЕНТРАЛЬНЫЙ КОМИТЕТ КПСС ПРЕЗИДИУМ ВЕРХОВНОГО СОВЕТА СССР СОВЕТ МИНИСТРОВ СССР

Figure 1.12. *Pravda article on the baptism of the plant named after L.I. Brezhnev in 1982 (source: rights reserved)*

In 2014, production of the Zenit rocket was suspended and the operator Sea Launch carried out its final launch. At the end of 2015, revenues amounted to approximately $25 million compared to $240 million in 2011. The plant was placed under short-term working and it seemed that bankruptcy was inevitable. In 2016, the Tsiklon-4 project with Brazil, which was to bring work to the plant, was halted, while Russian operator S7 purchased Sea Launch from RKK Energia. But S7, who wanted to purchase Zenit for Sea Launch, halted its discussions with YuzhMash. In 2017, Ukrainian entrepreneur Max Polyakov, who made his fortune from the Internet and founded the Californian company Noosphere Ventures, acquired the firm Firefly Aerospace, which develops the small Alpha liquid oxygen/kerosene launcher.

On July 21, 2019, the plant celebrated its 75th anniversary. That year, Firefly discussed a contract with YuzhMash for the production of 100 combustion chambers, 500 automation systems and 40 turbo pumps. But an unexpected event occurred: the boss of NKAU attempted to place YuzhMash under the control of Yuzhnoye to make the latter the beneficiary of the contract. But the plant opposed this and the boss of NKAU was replaced. Subsequent to this affair, the contract was not signed. In 2020, the plant reduced its workforce to 4,800 people and the government passed a law allocating €67.8 million to YuzhMash to repay debts owed to the state (taxes and loans) and employees (salaries). In the same year, it signed a memorandum with the South Korean company Caris for the production of 5,000 electric buses and 7,800 charging stations for approximately $850 million. Over the past 28 years, the plant has produced 65 Zenit-2 and Zenit-3 rockets, 22 Dnepr rockets, 14 first stages for the American Antares launcher, 19 RD-843 engines for the fourth stage of the European Vega launcher, 14 satellites and aircraft landing gears (39 for An-14/158 and 38 for An-140).

a) b) c)

Figure 1.13. *a) L.V. Smirnov; b) A.M. Makarov; and c) L.D. Kuchma (source: rights reserved)*

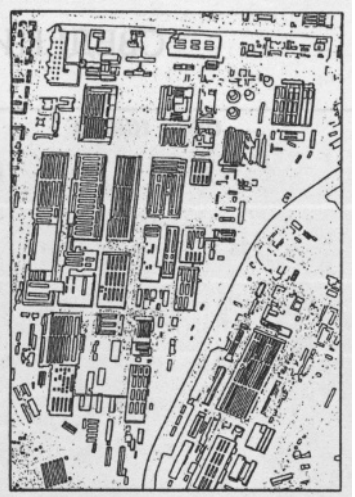
The Director of Plant No. 586 (YuzhMash in 1966, PO YuzhMash in 1978, named Brezhnev in November 1982) was successively G.M. Grigoriyev in 1950–1952, L.V. Smirnov in 1952–1961, A.M. Makarov in 1961–1986, L.D. Kuchma in 1986–1992, Yu. S. Alekseyev in 1992–2005, V.A. Shegol in 2006–2014 and S.N. Voit in 2014. In October 2019, the replacement of Voit by V.E. Kirichenko, Director of the Pavlograd mechanical plant, was announced, but did not materialize.

Leonid Smirnov (1916–2001) graduated from the Novocherkassk Industrial Institute. He worked at arms companies, then studied at the Academy of Defense Industry in 1948–1949. He headed the Central Institute of Automatics and Hydraulics (TsNII-173) in 1949–1951 and became Head of the 7th Glavka (Rockets) from September 1951 to June 1952. He headed Plant No. 586 from June 1952 to March 1961. He was then Deputy Minister of the Defense Industry from March to June 1961 before succeeding K.N. Rudnev in 1961–1963. Ultimately, he succeeded D.F. Ustinov at the Head of the Military-Industrial Commission (VPK) in 1963–1985. He was awarded the Order of the Red Banner of Labor for the R-5M strategic missile in 1956, the Order of Lenin for the R-12 in 1959, the Lenin Prize for R-12 in 1960 and was twice awarded the Hero of Socialist Labor Medal (1961 and 1982).

Aleksandr Makarov (1906–1999) graduated from the Institute of Railway Engineers in Rostov. He worked in automobile companies, but was arrested in 1940 to be sentenced to eight years in prison and sent to a gulag where he built a railway. In April 1942, he was released and took over the management of a motorcycle plant in the Sverdlovsk region. In 1948, he arrived in Dnepropetrovsk to head the Automobile Accessories Plant. Two years later, he became Production Manager of Plant No. 586. He quickly rose in rank becoming Main Engineer in 1954–1961 and then Director in 1961–1986. He was awarded the Order of the Red Banner of Labor for the R-5M strategic missile in 1956, the Order of Lenin for the R-12 in 1959, the Lenin Prize for R-12 in 1960 and was twice awarded the Hero of Socialist Labor Medal (1961 and 1976) and the State Prize in 1981 (11K68/Tselina-D).

Leonid Kuchma (born 1938) graduated from the University of Dnepropetrovsk in 1960. He joined Yuzhnoye where he was an Engineer in 1960–1964, Lead Engineer in 1964–1966, Chief Designer of the Tsiklon-2 launcher (11K67 and 11K69) in 1966–1972, Technical Director for flight tests in Baikonur in 1972–1975, Party Secretary for OKB and the Plant in 1975–1982, First Deputy to the General Designer and Head of the Design Bureau in 1982–1986 and Director General of YuzhMash in 1986–1992. He then forged a political career: Deputy in 1990–1992, Prime Minister of Ukraine in 1992–1993 and finally President of Ukraine in 1994–2004. During this period, he denuclearized his country (dismantling 176 ICBMs carrying 1,240 nuclear warheads) and he supported the marketing of Yuzhnoye launchers: Tsiklon with Brazil, SS-18, which became Dnepr, Zenit-2 which became Sea Launch, then Land Launch. He was awarded the Order of the Red Banner of

Labor in 1976, the Lenin Prize in 1980 (11K69/US-P complex) and the State Prize of Ukraine in 2003.



▲ *The Dnepropetrovsk Missile Development and Production Centre is by far the largest missile producing plant in the world with more than 185 800 m² of floorspace devoted to the production and final assembly of strategic missiles and space launch vehicles.* (Source: CIA)

Figure 1.14. *Layout of Plant No. 586, published in Jane's Defense Weekly on June 6, 1987, and an aerial view on July 21, 2019 (source: CIA and PivdenMash)*

Yuriy Alekseyev (born 1948) graduated from the University of Dnepropetrovsk in 1972. He joined YuzhMash where he began in the rocket-engine assembly shop. He became Deputy in 1985, then Main Engineer in 1988 and then Director General from October 1992 to July 2005. He headed the Ukrainian Space Agency from July 2005 to February 2009, and again from March 2010 until October 2014.

Figure 1.15. *Yu. S. Alekseyev (source: C. Lardier)*

Viktor Shegol (born 1951) graduated from the Dnepropetrovsk Institute of Technical Mechanics in 1971, served in the army in 1971–1973 and joined YuzhMash where he began in the satellite assembly shop. He graduated in engineering after taking evening classes at the Dnepropetrovsk Institute of Construction Engineers in 1980. He was Director General from October 2005 to 2013. He was awarded the Hero of Ukraine in 2004 and the State Prize in 2010.

Sergei Voit (born 1957) graduated from the Zaporizhia Technical School in 1976, the University of Dnepropetrovsk (PhysTech) in 1986 and the Alfred Nobel University in 2000. He worked at YuzhMash where he was First Deputy in 2005–2014, then Director General in March 2014. He was a Doctor of Economics and was awarded the State Prize of Ukraine in 2009 for the Sea Launch.

Key plant executives were the Main Engineer, Chief Technologist, Production Manager and Chief Metallurgist. The Main Engineers were successively S.N. Kurdin in 1951–1952, N.N. Kazakov in 1952–1954, A.M. Makarov in 1954–1961, N.D. Khokhlov in 1961–1965, L.L. Yagdzhiyev in 1965–1977, G.G. Komanov in 1977–1982, V.S. Sokolov in 1982–1987, V.A. Andreyev in 1987–1988, Yu. S. Alekseyev in 1988–1992, A.S. Korotkov in 1992–2010, V.I. Dyudov in 2010–2016 and V.V. Sokolov in 2016.

Sergei Kurdin (1912–2008) first worked at the No. 4 Gun Plant, which was evacuated to Krasnoyarsk in 1941–1943. He then became Chief Technologist at Kaliningrad Plant No. 8 in 1944. From May to November 1946, he was sent to Germany to study the V-2. He was the Chief Technologist for the R-1 and R-2 of Korolev. In 1951–1952, he was Main Engineer at Plant No. 586, then returned to the Korolev OKB in 1953–1957.

Nikolai Khokhlov (1918–1999) graduated from Bauman Technical University (MVTU) in 1941. He worked at Plant No. 8, which was evacuated to Perm in 1941–1943. It returned to Moscow and became Plant No. 88 in Kaliningrad. In 1951, he was appointed Head of Sector of the 7th Glavka of the Ministry of Armaments. In September 1952, he became Chief Technologist at Plant No. 586, then Main Engineer in 1961–1965. He obtained the Order of the Red Banner of Labor in 1956 (R-5M), the Order of Lenin in 1959 (R-12), the Hero of Socialist Labor Medal in 1961 (R-14) and the Lenin Prize in 1964 (R-16). In March 1965, he became Deputy Minister of General Machine Building (MOM) in charge of military and space rockets. He was then responsible for the companies of Korolev, Chelomei, Yangel, Makeyev, etc. In 1984, he fell victim to the plot that ousted MOM Minister Afanasiyev and became an Engineer at NPO TechnoMash until 1996.

Lukas Yagdzhiyev (1910–1993) joined the Dnepropetrovsk automobile plant in 1947 where he became Shop Leader and then Head of Production in 1954–1959. In 1963, he graduated from the University of Dnepropetrovsk, then became Main Engineer of the plant in 1965–1977. He was awarded the Hero of Socialist Labor Medal in 1961 (R-14), the Lenin Prize in 1963 and the State Prize in 1977.

Gennady Komanov (1924–2003) was part of the first “space” graduation year group at the University of Dnepropetrovsk in 1954. He joined YuzhMash where he became Main Engineer in 1977–1982. He then became the Director of the Dnepropetrovsk subsidiary of the Institute of Machine-Building Technology in 1982–1987, First Director of the Dnepropetrovsk Youth Aerospace Education Center (NTsAOMU) in 1996–1997. He was awarded the Order of Lenin in 1961 (R-14), the Lenin Prize in 1961 and the Hero of Socialist Labor Medal in 1969 (25 years of YuzhMash).

Vladimir Sokolov (1930–2008) graduated from the Leningrad Mechanical Institute (LVMI or Voenmekh “Ustinov”) in 1954. He joined YuzhMash where he became Head of Satellite Production in 1962–1966, Deputy in 1966–1982, then Main Engineer in 1982–1987. He then became First Deputy at the Institute of Machine-Building Technology in 1987–1994. He was awarded the Lenin Prize in 1970 for the Meteor satellite and the Hero of Socialist Labor Medal in 1982.

Vladimir Andreyev (born 1942) graduated from the Zhdanov Metallurgical Institute in 1964. He joined YuzhMash where he became Chief Technologist in 1985–1987, then Main Engineer in 1987–1988. In 1988–1991, he was Head of the First Principal Directorate of MOM. He then headed the companies KompoMash in 1991–1993, Askond in 1993–1997, Kosmotras since 1997 (Director General, then Chairman in 2012). He was awarded the State Prize of Russia in 1986 and the State Prize of Ukraine in 2003.

Aleksandr Korotkov (born 1940) joined Plant No. 586 in 1959, where he became Main Engineer in 1992–2010. He was awarded the State Prize in 1989, the State Prize of Ukraine in 2002 and the Prize of the Government of Russia in 2005. Vyacheslav Dyukov (born 1950) graduated from the University of Dnepropetrovsk in 1973. He joined Plant No. 586 where he became Deputy in 1988, then Main Engineer in 2010–2016. In August 2016, he was replaced by Vladimir Vyacheslavovich Sokolov.

The plant's Chief Technologist was successively G.F. Tumanov in 1951–1952, N.D. Khokhlov in 1952–1961, V.A. Kartashov in 1961–1963, V.M. Kulchev in 1963–1985, V.A. Andreyev in 1985–1987, V.A. Turov in 1987–2010, E.I. Kamenskyi in 2010–2012, I. Yu. Krepak in 2012–2013 and A.N. Prokofiyev in 2013.

Gennady Tumanov (1918–1989) graduated from MVTU in 1941. During the war, he worked in the Votkinsk Gun Plant. He then moved to Plant No. 88 in 1946–1949, Plant No. 385 in Zlatust in 1949–1951, then Plant No. 586 (Chief Technologist in 1951–1952, Deputy Main Engineer in 1952–1966). In 1966–1976, he was Main Engineer of the Principal Technical Directorate of MOM. Lastly, in 1976–1981, he was Main Engineer of the Materials TsNII (now NPO Kompozit). He was awarded two Orders of Lenin (1961, 1966) and two Orders of the Red Banner of Labor (1959, 1969). He had an adopted a daughter, Ludmilla Talalayeva, who married Leonid Kuchma in 1962.

Viktor Kulchev (1921–1997) graduated from MVTU in 1954. He joined Plant No. 586 where he became Chief Technologist in 1963. He was awarded the Hero of Socialist Labor Medal in 1969 (25 years of YuzhMash) and the Lenin Prize in 1976. Valentin Turov (born 1945) graduated from the Kharkov Aviation Institute in 1968. He joined Plant No. 586 where he became Chief Technologist in 1987–2010. He was awarded the State Prize in 1986.

The Head of Production was A.M. Makarov in 1951–1954, L.L. Yagdzhiyev in 1954–1959, L.M. Ganzburg in 1960–1965, D.I. Arkhipov in 1965–1966, V.I. Sichevoi in 1966–1993, and is currently O. Yu. Lebedev.

Lazar Ganzburg (1910–1995) graduated from the Kharkov Institute in 1936, then worked at Omsk Plant No. 29 (Aircraft Engines). He joined YuzhMash in 1948. He headed rocket production in 1960–1964, but following a complaint by Algeria regarding tractors produced by the plant, a reorganization was decided on and Ganzburg was transferred to tractor production. Dmitriy Arkhipov replaced Ganzburg in March 1965. One year later, he took over the management of the Experimental Work Sector of OKB-586 (Sector No. 22 in 1972), which he headed for 20 years.

Vladimir Sichevoi (1929–2005) joined YuzhMash in 1952. While working, he completed his degree at the University of Dnepropetrovsk in 1967. He was Deputy in 1966, then Head of Space Production in 1972–1993, then First Deputy to the Director General in 1993–2005. He was awarded the Order of the Red Banner of Labor in 1961, the State Prize in 1977, the Lenin Prize in 1991 and the Hero of Ukraine Medal in 1999.

With the Ministry of Defense being the customer, the Plant had a military representative whose boss was successively P.S. Aleksandrov from October 1951 to February 1953, A.N. Zvezdov from February 1953 to June 1954, B.A. Komissarov in 1954–1960, N.S. Sivorin (1920–2016) in 1961–1968, A.F. Volodyko (born 1929) in 1968–1971, V.A. Savin in 1971–1973, S.Z. Bobchikhin in 1973–1981, N.M. Kolos in 1981–1984, V.P. Tenkov in 1984–1989, A.F. Kucherov in 1989–1995 and N.B. Alekseyev in 1995.

Pavel Aleksandrov (1907–1964) was a mechanic at MosGIRD, then at RNII from 1933, he was then at Bleicherode (V-2 recovery) in 1946–1947, then at NII-88 in 1947–1951, at Dnepropetrovsk in 1951–1953, at the Bolshevik Plant in Kiev in 1954–1955, at Plant No. 385 in Zlatust in 1955–1956, then returned to OKB-1 of Korolev in 1957–1964. The cosmonaut A.P. Aleksandrov was his son.

Boris Komissarov (1918–1999) graduated from the Dzerzhinskyi Artillery Academy in 1941, took part in the war, worked at Kapustin Yar in 1947–1954, in Dnepropetrovsk in 1954–1960, then became Head of the 7th Glavka of the Ministry (GKOT) in 1961–1963, Deputy Minister in 1963–1970, and Deputy Chairman of the VPK in 1970–1986. He was awarded the Hero of Socialist Labor Medal in 1982, five Orders of Lenin (1959, 1961, 1968, 1977, 1982).

The Plant and the OKB had Communist Party organizations (CPSU)[2], some of whose members went on to have significant careers. Among the Secretaries of the plant CP, there were V.D. Kryuchkov (1928–2017) in 1969–1974 and L.D. Kuchma in 1980–1982 (President of Ukraine in 1994–2004). Among the Secretaries of the OKB CP, there were V.F. Utkin in 1954–1955 and 1955–1957 (successor of Yangel and Director of OKB-586 in 1971–1990), B.I. Gubanov in 1963–1964 (Chief Designer for Energia-Buran in 1982–1993), L.D. Kuchma in 1979–1980 and A.A. Negoda in 1980–1985, etc.

2 The CP in Ukraine (KPU) was headed by V.V. Sherbitskyi (1918–1990) in 1972–1989. E.V. Kachalovskyi (1926–2011) was First Secretary of the Dnepropetrovsk CP in 1976–1983. V.G. Boyko (1931–2014) succeeded him in 1983–1987. The KPU Defense Industry Sector was headed by S.P. Metlov (1918–?) in 1958–1988, then by V.D. Kryuchkov (1928–2017) in 1988–1991.

1.3. The Dnepropetrovsk Design Bureau

In May 1951, V.S. Budnik formed a Serial Production Design Bureau (OGK), Section No. 101 of the Plant KB, and brought with him a group of engineers from OKB-1, Plant No. 88 and OKB-456 (25 people). On July 6th, Order No. 142k appointed him as Chief Designer. In August 1951, the first group of 18 people arrived. Vasily Budnik was then assisted by A.P. Eliseyev (Isayev's Deputy) and N.S. Shnyakin (Glushko's Deputy).

Vasily Budnik (1913–2007) graduated from the Moscow Aviation Institute in 1940. At the same time, he was a pilot and parachutist at the Central Flying Club at Tushino. In 1941, he became an aircraft armament specialist at Ilyushin. In 1944, he joined NII-1, then participated in the recovery of German rockets in 1945–1946. He met Korolev in August 1945, then joined his Sector of NII-88 in September 1946. He participated in the development of the R-1 and R-2 rockets. In July 1951, he moved to Dnepropetrovsk Plant No. 586 to organize their serial production. In 1956, he was awarded the Order of the Red Banner of Labor for the R-5M.

Figure 1.16. *Meeting with V.S. Budnik in 2005 (source: J. Terweij)*

Aleksey Eliseyev (1913–1990) worked on the R-101 rocket (derived from the German Wasserfall) in 1946–1949, then became Isayev's Deputy (OKB-2 NII-88). He remained at OKB-586 from 1952 to 1957 before returning to Isayev from 1957 to 1987 where he dealt with engines for submarine-launched rockets (SLBM). For this, he was awarded the State Prize in 1978.

Nikolai Shnyakin (1901–1996) graduated from the Moscow Metallurgical Institute in 1931, then worked at Aviation Plant No. 213. After forming part of a delegation that visited Italy, France, England and the United States in 1936, he was arrested and sent to the Kazan Charashka (OKB-16 in 1939–1944). He was Deputy to Glushko in December 1946, to Budnik in November 1951, Chief Designer at the

Plant in 1954–1955, then returned to OKB-456 in December 1955. On September 7, 1957, 40 Chinese nationals came to Moscow to negotiate the supply of military technology by the USSR (aid for atomic bomb and missiles). On October 15th, an agreement was signed: it covered the R-2 (surface-to-surface), S-75 (ground-to-air), S-2 Sopka (coastal defense) and K-5M (air-to-air) missiles. On December 24th, 102 Russian specialists left for China. For the transfer of R-2, P.I. Meleshin from OKB-1 and Shnyakin from OKB-456 were sent to China from August 1958 to July 1960 (with Andrey Zarubin, Viktor Borodin, Igor Larionov, Ivan Lyska, Yevgeniy Semenov, Ivan Kozlov, Dmitriy Anvarov, etc., from Plant No. 586). The first Chinese R-2 was launched on November 5, 1960. From December 1962 to December 1966, Shnyakin was Main Engineer and Glushko's Deputy. He was awarded the Lenin Prize in 1966, two Orders of Lenin (1956, 1961) and two Orders of the Red Banner of Labor (1957, 1960).

The first 25 to arrive in Dnepropetrovsk were V.S. Budnik, A.P. Eliseyev, N.S. Shnyakin, N.F. Gerasyuta, M.B. Dvinin, M.F. Demertsev, N.N. Zhukov, P.P. Karaulov, V.V. Kozlov, M.I. Kormiltsev, V.N. Lobanov[3], M.V. Labanova, A.F. Nikitin, V.G. Peskov, L.F. Peskova, E.L. Rivlina, I.M. Ryabov[4], L.N. Sprygina, N.I. Tyurin, F.F. Falunin, I.I. Ivanov, M.R. Gnesin, M.D. Nazarov, L.M. Nazarova and N.I. Sidelnikov.

On February 13, 1953, Decree No. 442-212 ordered the launch campaigns of R-5 in October 1953, R-11 in March 1954 and R-12 in August 1955. The R-12, of which Budnik was the Chief Designer, was a 35-t rocket with a range of 1,500 km. It was equipped with a nitric acid/kerosene engine with a thrust of 50 t. But Decree No. 674-292 of April 10, 1954 transformed the SKB into OKB-586 and on July 9th Yangel became its Head and Chief Designer. The First Deputy was Budnik from August 12, 1954 to November 1967, who was then Head of KB-1 until October 20, 1970. He was awarded the Hero of Socialist Labor Medal in 1959, the Lenin Prize in 1960 and an Order of Lenin in 1961. But when Yangel died, Budnik was not appointed as his successor and he left the company. He joined the Institute of Mechanics at the National Academy of Sciences of Ukraine in March 1972 (Institute of Theoretical Mechanics in 1980). Doctor of Technical Sciences in 1960, Professor in 1962, he was Corresponding Member in 1964, then Academician in 1967 of the National Academy of Sciences of Ukraine.

3 Vladimir Nikolayevich Lobanov (1921–1997) graduated from MVTU in 1944, worked at NII-88 in 1946–1951, at OKB-586 in 1951, Sector Head of Guidance and Measurement Systems in 1954–1981, Order of Lenin in 1959–1961.

4 Ivan Matveyevich Ryabov (1910–?) graduated from the Leningrad Industrial Institute, worked at the NKMZ Plant, evacuated to Yurga in 1941, went to the Front in 1942–1946, at OKB-1 (R-2), then at OKB-586 in 1951.

In fact, Yangel's successor was V.F. Utkin (1923–2000) who had been First Deputy since November 1967. Vladimir Utkin was the son of Fedor (1896–1940) and Anisya (1894–1981). They had four children: Nikolai (1919–1989), Vladimir (1923–2000), Piotr (1925–1974) and Aleksey (1928–2014). Nikolai graduated from the Leningrad Military Mechanical Institute (LVMI) in 1945, then worked in arms plants. In 1954, he taught at the Institute, becoming its First Prorector in 1961–1980, Head of Chair in 1974–1983, then Professor in 1983–1989. Piotr made his career in the army.

Aleksey, meanwhile, graduated from LVMI in 1951, then worked at TsKB-34/KBSM in Leningrad: Engineer, Representative in Production Plants in 1959, Head of a Construction Sector in 1963, Deputy Chief Designer in 1967, Chief Designer at KB-4 in 1970–2007. He was a specialist in missile launching facilities, including the rail-based ICBM. He was a Doctor of Sciences in 1989, Professor in 1993, Lenin Prize in 1976 and State Prize in 1981.

Vladimir was 18 years old when the war broke out: he was a soldier from 1941–1945. He then graduated from the Leningrad Military Mechanical Institute in 1952: he graduated from NII-4 in Bolshevo. He joined Plant No. 586 where he became Secretary of PartKom in 1954, Head of Sector in 1956, again Secretary of PartKom from December 1956 to July 1957, Sector Deputy from July 1957 to December 1958, Head of a Construction Group in December 1958, Deputy Chief Designer on November 9, 1960 (replacing L.A. Berlin), First Deputy on November 24, 1967, "interim" boss of OKB-586 on November 1, 1970, then Yangel's successor on October 29, 1971.

On October 1, 1966, the OKB and Plant No. 586 became Yuzhnoye and YuMash of the Ministry of General Machine Building (MOM). On October 15, 1986, they merged to form a scientific–industrial association (NPO). Utkin was its Director General and General Designer until November 1990. He then took over the management of TsNII Mash until 2000. He was a Doctor of Technical Sciences in 1967, Professor, Corresponding Member in 1972, then Academician in 1976 of the National Academy of Sciences of Ukraine, Academician of the USSR Academy of Sciences in 1984. He was awarded the Order of the Red Banner of Labor in 1959 for R-12, the Order of Lenin in 1961 for R-14, the Lenin Prize in 1964 for R-16, the Order of Lenin in 1966, the First Hero of Socialist Labor Medal in 1969 for R-36, the second in 1976 for R-36M, the Order of Lenin in 1973 (50 years) and 1983 (60 years), and lastly the State Prize in 1980 for Tsiklon-3. In August 1949, he married Valentina (1924–1994) with whom he had a daughter, Natasha, in 1950 (N.V. Sitnikova).

In November 1990, Utkin was replaced by S.N. Konyukhov (1937–2011). The latter graduated from the University of Dnepropetrovsk in 1959 and joined the Uktin

group. From February 1962 to May 1963, he was in the group of M.I. Galas, then from May 1963 to July 1964, Chief Designer of the R-56 rocket. He headed Sector No. 21 (Information) in 1964–1966, Sector No. 32 (Reliability) in 1966–1974, a Sector of KB-2 in 1974–1978, Head of Sector and Deputy of Complex No. 1 in 1978–1984, Head and Chief Designer of KB-3 in 1984–1986, and has been First Deputy since December 1986. He was Doctor of Technical Sciences in 1987, Professor in 1991, Academician of Ukraine in 1992, winner of the State Prize in 1977, Order of the Red Banner of Labor in 1982 for R-36MUTTKh and MR-UR-100UTTKh, State Prize of Ukraine in 2001, Hero of Ukraine in 2004 and Prize of the Government of Russia in 2004 for Dnepr.

In 2010, management was entrusted to A.V. Degtyarev (1951–2020). He graduated from the Leningrad Military Mechanical Institute (LVMI) in 1975, then joined Yuzhnoye: Engineer, Lead Engineer, Head of Group, Head of Commerce Department, Deputy for Economic Affairs in 1999 (he graduated from the Economics Faculty of the University of Dnepropetrovsk in 2001), First Deputy in 2005–2010, then Director General and General Designer in 2010–2016. In 2016, he was investigated as part of a corruption case before being cleared in 2018. The interim was assured by the Main Engineer M.A. Bondar. Degtyarev returned to head Yuzhnoye in 2018. He died of Covid-19 on November 24, 2020. He was posthumously awarded the Hero of Ukraine Medal on November 27, 2020.

On January 13, 2021, the new Director General was Aleksandr Pavlovich Kushnarev (born 1964). He graduated from the University of Dnepropetrovsk in 1987, served in the army in 1987–1989, joined Yuzhnoye where he became Head of Department in 2002, Head of Complex No. 1 in 2005, First Deputy for Systems Design in 2010.

a) b) c)

Figure 1.17. *a) V.F. Utkin; b) S.N. Konyukhov; and c) A.V. Degtyarev (source: rights reserved)*

Figure 1.18. *A.P. Kushnarev, Director General in 2021(source: rights reserved)*

Yuzhnoye's First Deputy was successively V.S. Budnik in 1954–1967, then V.F. Utkin in 1967–1971, B.I. Gubanov in 1972–1982, L.D. Kuchma in 1982–1986, S.N. Konyukhov in 1986–1990, A.N. Mashenko in 1990–2005, A.V. Degtyarev in 2005–2010 and A.P. Kushnarev in 2010–2021.

The Main Engineer was successively B.I. Gubanov in 1965–1968, N.S. Sivorin in 1968–1969, L.A. Karakhanyan (1923–2000) in 1969–1985 (State Prize in 1972 for Tsiklon-2-19 US-A satellite), A.F. Grishin (born 1933) in 1985–1993 (State Prize in 1976, State Prize of Ukraine in 1980), V.G. Vasilin (born 1936) in 1993–2012 (State Prize of Ukraine in 2002), then M.A. Bondar (born 1955) in 2012.

The Deputy for Science was successively Yu. A. Smetanin in 1985–1999 (First Deputy), V.I. Perlik in 1999–2009, A.V. Novikov in 2010–2015, A.E. Kashanov in 2015–2020, then Vladimir Shekhovtsov.

At first, the Deputies were M.I. Duplishev, L.A. Berlin, V.A. Kontsevoi, etc. Mikhail Illarionovich Duplishev (1912–1993) graduated from the Volgograd Polytechnic Institute in 1937 and worked at Perm Gun Plant No. 172 in 1941–1945. He was Deputy Chief Designer at OKB-614 in Saratov in 1945–1948, joined Korolev, studied at the Academy of Defense Industry in 1949–1951, Chief Designer at SKB-385 from December 1954 to May 1955, Deputy Chief Designer at OKB-586 in 1955–1960 (Head of the Strength Sector), was in charge of firings on the "Object 100" test bench (Order of the Red Banner of Labor for R-12 in 1959), Doctor of Technical Sciences in 1961, Professor at the University of Dnepropetrovsk in 1955–1990 (Head of Chair No. 1 at the Faculty of Physics and Technology). Lev Abramovich Berlin (1920–1960) graduated from the Kiev Polytechnic Institute in 1948, he joined the plant where he became Deputy Chief Designer at the plant in 1951 (R-1, R-2 and R-5), then at the OKB for Production in 1955–1960 (R-12, R-14 and R-16), Lenin Prize in 1960 (posthumously). Vasily Antonovich Kontsevoi (1924–1960) graduated from the University of Kishinev in 1951, he joined the plant

where he became Deputy Chief Designer at the OKB in 1955–1960. Berlin and Kontsevoi both died at Baikonur in the tragedy of October 24, 1960 (explosion of the first R-16 on the launch pad).

Design Bureau KB-1 (Design) was a Sector in April 1953, then Complex No. 1 in January 1962. It was headed by V.M. Kovtunenko in 1954–1967 and E.M. Kashanov in January–December 1967. In January 1968, KB-1 was formed from Complexes No. 1 (Design), No. 2 (Control and Dynamics), No. 3 (Strength), Sectors No. 311 and No. 313 of KB-3. It was headed by Budnik from December 8, 1967 to October 20, 1970. There were four Deputies: E.M. Kashanov, Yu. A. Smetanin, N.F. Gerasyuta and P.I. Nikitin. In October 1970, KB-1 was abolished and the sectors moved to KB-2; Complexes Nos. 2 and 3 resumed their autonomy. In February 1972, Complex No. 1 was reformed and the sectors returned from KB-2. It was headed successively by Yu. A. Smetanin in 1972–1985, N.V. Tsurkan in 1986–1992, A.N. Mashenko in 1992–1999, Yu. P. Brilev in 1999–2005, A.P. Kushnarev in 2005–2012 and P.G. Degtyarenko in 2012–2017.

Erik Mikhailovich Kashanov (1928–1971) graduated from the Kovrov Institute of Technical Mechanics in 1942, then MVTU in 1952, joined OKB-586 where he became Head of Complex No. 1 in January 1967, Deputy of KB-1 in December 1967, Deputy of KB-2 in 1970–1971. As a Doctor of Technical Sciences, he was a Professor, Lenin Prize in 1964.

Yuriy Alekseyevich Smetanin (1925–1999) took part in World War II where he was wounded. He then graduated from the Moscow Aviation Institute in 1952. His thesis project was a strategic winged rocket. He then joined Dnepropetrovsk Plant No. 586, then the OKB in 1954: Engineer, Head of Sector in 1961, Deputy of KB-3 in October 1965, Deputy of KB-1 in 1968, of KB-2 in 1970, Head of Complex No. 1 in 1972–1985 and First Deputy for Science in 1985–1999. He was a Doctor of Technical Sciences in 1978, Professor in 1982, Corresponding Member of the Academy of Ukraine in 1988, Hero of Socialist Labor in 1982, Lenin Prize in 1976, State Prize of Ukraine in 1985, Order of Lenin in 1961 (Vostok-1), Order of the Red Banner of Labor in 1959 (R-12) and Order of the October Revolution in 1971.

Nikita Vsevolodovich Tsurkan (born 1940) graduated from the Kharkov Aviation Institute in 1964, joined Yuzhnoye where he became Head of Complex No. 1 in 1986–1992. He was awarded the State Prize in 1982 and the Lenin Prize in 1990.

In 1992, Tsurkan was replaced by Aleksandr Nikolayevich Mashenko (born 1952). After graduating from the University of Dnepropetrovsk in 1976, he joined Yuzhnoye where he was Chief Designer of the 15A18 and 15A18M missiles. On September 21, 1992, he became the company's First Deputy and Head of Complex

No. 1. On May 21, 1999, Complexes No. 1 (Yu. P. Brilev) and No. 2 (A.M. Podolinny) were again reunited in KB-1, headed by Mashenko. On November 20, 2001, he became First Deputy of Yuzhnoye and, simultaneously, Head of KB-1 and KB-2, which he headed until December 2010. He was then appointed First Deputy for Technical and Management Matters. He was awarded the State Prize of Ukraine in 1999.

Yuriy Petrovich Brilev (born 1937) graduated from the University of Dnepropetrovsk in 1959. He joined Yuzhnoye where he became Deputy in 1992, then Head of Complex No. 1 from April 1999 to 2005. He was awarded the Lenin Prize in 1991.

Complex No. 1 was headed by A.P. Kushnarev in 2005–2012, who became First Deputy for Systems Design in 2012, then Director General in 2021.

On January 25, 2013, Complexes No. 1 (Kushnarev) and No. 2 (Sirenko), Sectors Nos. 3, 11 and 12 and Sector No. 10 (which gathered Chief Designers of launchers) were grouped together in KB-1. It was entrusted to Pavel Glebovich Degtyarenko (born 1962). He graduated from the Leningrad Military Mechanical Institute in 1985, then worked at Yuzhnoye where he becomes Deputy Chief Designer of KB-2 in 1998–2012, Head of KB-1 in 2013–2017, then Head of the Ukrainian Space Agency (NKAU) in 2017–2019.

In 2018, KB-1 was headed by Maksim Aleksandrovich Degtyarev, son of A.V. Degtyarev. His Deputy, E. Yu. Baranov headed Complex No. 1. Complex No. 11 for Land Infrastructure was created from Sectors Nos. 11 and 12 in 2016. It is headed by V.N. Balashov.

KB-2 (Rockets), which was Complex No. 4 in 1962–1967, was headed by B.I. Gubanov in 1967–1971, M.I. Galas in 1972–2001, A.N. Mashenko in 2001–2011 and E.I. Shevtsov in 2011–2017.

Boris Ivanovich Gubanov (1930–1999) graduated from the Kazan Aviation Institute in 1953 and joined Yuzhnoye: Main Engineer in 1965, Head of KB-2 in 1967 and First Deputy in 1972. He moved to RKK Energia in 1982 as First Deputy and headed the Energia-Buran program. He then headed the company Air Launch in 1993–1999. He was a Doctor of Technical Sciences in 1978. He was awarded the Order of the Red Banner of Labor in 1959 and 1961, the Hero of Socialist Labor Medal in 1976 and the Lenin Prize in 1980.

Mikhail Ivanovich Galas (1929–2006) graduated from the Leningrad Military Mechanical Institute (LVMI) in 1955. He was first an Engineer at SKB-385 before joining Yuzhnoye in 1956. From 1958, he was Chief Designer (R-14, R-26, R-36,

etc.). He was Deputy in 1970, then Chief Designer of KB-2 in 1972–2001. He was a Doctor of Technical Sciences in 1987, Professor in 1990, Corresponding Member of the National Academy of Sciences of Ukraine, Order of Lenin in 1961, State Prize in 1967, Hero of Socialist Labor in 1976, Lenin Prize in 1990.

In 2001, Aleksandr Mashenko was simultaneously the company's First Deputy and Head of KB-1 and KB-2. In December 2010, he was succeeded by Yevgeniy Ivanovich Shevtsov (who had been Deputy since 2008). In February 2014, he was also appointed Deputy Director General for Construction and Construction Supervision.

The Rocket Designers included the following: Stanislav Ivanovich Us (born 1936), Main Designer of R-36M in 1985, Deputy Director General of MKK Kosmotras in 1997–2017, then Head of Sector No. 10, Hero of Socialist Labor in 1990, Lenin Prize in 1982, Order of Lenin in 1976 and 1990, Prize of the Government of Russia in 2004; Vitaly Leonidovich Katayev (1932–2001), Lead Rocket Designer, Instructor in the Central Committee's Defense Industry Sector in 1974–1990, then worked in the presidential aircraft in 1990–1992; Valentin Vladimirovitch Koshik (1936–1999) headed Rocket Design in 1969–1990, Representative in Baikonur in 1991–1999, State Prize in 1982, Order of Lenin in 1987; Vladimir Gennadiyevich Komanov (1938–2019), son of G.G. Komanov, Main Engineer at YuzhMash, he was Chief Designer in 1966–1986, Main Designer in 1986–1996, then Deputy General Designer for the Sea Launch program in 1996–2003. He was awarded the Lenin Prize in 1980 and the State Prize of Ukraine in 1995.

KB-3 (Satellites), which was Complex No. 8 in 1962–1967, was headed by V.M. Kovtunenko in 1965–1977, B.E. Khmyrov in 1977–1984, S.N. Konyukhov in 1984–1987, V.I. Dranovskyi in 1987–2005, A.L. Makarov in 2005–2014, V.N. Masley in 2014–2019, then K.G. Belusov in 2019.

Vyacheslav Mikhailovich Kovtunenko (1921–1995) joined the Rybinsk Aviation Institute in 1939, but left for the Front in 1941 where he was wounded and became a war invalid. In 1942, he joined Leningrad University, which was evacuated to Saratov. In 1944, he attended the University when it returned to Leningrad and graduated in 1946. He then joined NII-88 in Korolev's Sector. In 1953, he left to join Yangel in Dnepropetrovsk where he became Deputy Head of Sector, then Chief Designer of KB-3 until February 1977. At the same time, he worked at the Dnepropetrovsk subsidiary of the Ukrainian Mechanics Institute in 1962–1970. Lastly, he was the General Designer of NPO Lavochkin until 1995. He was a Doctor of Technical Sciences in 1960, Professor in 1962 (Head of Chair at the University of Dnepropetrovsk in 1961–1967, then of the Moscow Physical-Technical Institute (MFTI) in 1979–1989), Corresponding Member of the National Academy of

Sciences of Ukraine in 1972, Corresponding Member of the Academy of Sciences of the USSR in 1984. He was awarded the Order of Lenin in 1959 (R-12), the Lenin Prize in 1960 (R-12), the Hero of Socialist Labor Medal in 1961 (R-14), the State Prize in 1978 (AUOS satellite) and the Order of Lenin in 1986 (Vega probe).

For his part, Boris Yevgeniyevich Khmyrov (1934–2004) graduated from the Leningrad Mechanical Institute (LVMI) in 1957, then worked at OKB-586 where he became Head of KB-3 in 1977–1984. He was awarded the State Prize in 1977. Vladimir Yosypovych Dranovskyi (born 1934) graduated from the University of Dnepropetrovsk in 1957 then worked there until 1961, joined OKB-586 where he was Head of Sector, then Head of KB-3 in 1987–2005, Member of MNTSpoKI/Council for the Cosmos in 1982–1991. He was a Doctor of Technical Sciences in 1992, Professor, Correspondent of the National Academy of Sciences of Ukraine in 2003. He was awarded the State Prize in 1970 and the State Prize of Ukraine in 1999. Aleksandr Leonidovich Makarov (born 1949) joined Plant No. 586 as a laborer in 1967, graduated from the University of Dnepropetrovsk in 1976, became Head of a test station in 1983–1987, Shop Deputy in 1987–2000, Head of Department in 2000, Chief Designer in 2005, Deputy General Designer in 2014, State Prize of Ukraine in 2002. In 2014, he was replaced by Vladimir Nikitovich Masley, then by Konstantin Georgiyevich Belusov in 2019.

The Satellite Designers included the following: Sergei Sergeyevich Kavelin (1937–2020), State Prize in 1973 and State Prize of Ukraine in 2011; Anatoly Mikhailovich Popel (born 1934), State Prize in 1986; Vitaly Sergeyevich Gladilin (1936), State Prize in 1986; Ivan Nikolayevich Lysenko (born 1934), State Prize in 1986; Nikolai Alekseyevich Zharikov (1918–1987); Lenin Prize in 1976; Vadim Nikolayevich Pappo-Korystin (1934–2013), Chief Designer of the Meteor satellite in 1962–1969, Lenin Prize in 1970, and who participated in the creation of the Dnepropetrovsk Youth Aerospace Education Center in 1996 and contributed to the publication of several books on the history of Yuzhnoye; Nikolai Makarovich Stepanov (born 1928); Aleksandr Aleksandrovich Krasovskyi (1931–1994), Head of the Ballistics Sector in 1962–1978.

KB-4 (Liquid-Propellant Engines) was headed by I.I. Ivanov in 1958–1979, A.V. Klimov in 1979–1994, V.N. Shnyakin in 1994–2012, then A.A. Prokopchuk in 2012. To be cited among the people who joined KB-4 in 1951 were M.D. Nazarov and L.M. Nazarova who worked at OKB-456 in 1948–1951, M.R. Gnesin[5], etc.

5 Mikhail Ruvimovich Gnesin (1927–1989) graduated from MAI in 1949 and joined OKB-456. In 1951, he moved to OKB-586 where he dealt with the engine of the R-12. He then returned to OKB-456 in 1952–1989. He was awarded the Order of the Red Banner of Labor in 1959 (RD-214 and R-12), Order of Lenin in 1961 (RD-216 and R-14), State Prize in 1967 (RD-253 of UR-500) and Lenin Prize in 1990 (RD-170 of Zenit-2).

Ivan Ivanovich Ivanov (1918–1999) graduated from the Rybinsk Institute of Technical Aviation in 1940. He joined the Kazan Engine Plant, then moved to Glushko's OKB-16 and at the same time attended the Kazan Aviation Institute. In 1946, he joined OKB-456 as an Engineer (Chief Designer in 1948). In 1951, he moved to OKB-586 where he was Head of the Liquid-Propellant Engine Sector. He was awarded the Order of the Red Banner of Labor for R-5M in 1956, the Order of Lenin for R-12 in 1959 and the Hero of Socialist Labor Medal for R-14 in 1961. He headed KB-4 in 1958–1979, then became Deputy for Liquid and Solid Engines (KB-4 and KB-5) in 1979–1987. He was awarded the Lenin Prize in 1964 for R-16, the State Prize in 1977 for the upper part of 15A14 and 15A15. He was a Doctor of Technical Sciences in 1962, Professor in 1962 (University of Dnepropetrovsk), Corresponding Member of the National Academy of Sciences of Ukraine in 1978 and he worked at the Dnepropetrovsk subsidiary of the Ukrainian Institute of Mechanics in 1991–1999.

Aleksandr Viktorovich Klimov (1929–2009) headed KB-4 in 1979–1994. He was a Doctor of Technical Sciences and Professor. He was awarded the Lenin Prize in 1982 for R-36MU and MR-UR-100U. Then, it was the turn of Vladimir Nikolayevich Shnyakin (1936–2012), son of Glushko's Deputy. After graduating from the University of Dnepropetrovsk in 1958, he joined OKB-586 to be successively Head of Sector in 1979–1987, Deputy in 1987–1994, Head in 1994. In March 2002, KB-4 and KB-5 merged into a single Propulsion Bureau headed by V.N. Shnyakin with, as Deputy for Solid Propellants, N.S. Golubenko, then A.S. Kirichenko. He was awarded the State Prize in 1990 for Zenit (11K77) and the State Prize of Ukraine in 2012 (posthumously). In 2012, KB-4 and KB-5 were separated again. Aleksandr Aleksandrovich Prokopchuk took over the management of KB-4. His Deputy was Vladimir Andreyevich Shulga (born 1938). After graduating from the Kharkov Aviation Institute in 1961, he made his career at KB-4. He was awarded the State Prize of Ukraine in 2012 for the upper stage of Vega.

KB-5 (Solid-Propellant Engines): Decree No. 316-137 of April 4, 1961 started solid-propellant activities in Dnepropetrovsk. By Order No. 148 of April 15, 1961, the Pavlograd Artillery Range SKB-10 became subsidiary No. 2 of OKB-586 for Solid-Propellant Engines (RDTT) with B.E. Andreyev as Chief Designer. At the same time, in December 1961, OKB-586 created Sector No. 31 under the direction of Mikhail Borisovich Dvinin. On May 22, 1963, Decree No. 565-197 decided on the RT-20P (8K99) missile and the Construction Sector of subsidiary No. 2 became KB-5, which was headed successively by G.D. Khorolskyi in 1963–1966 (Dvinin Deputy in 1963–1966), V.I. Kukushkin in 1966–1993 and N.S. Golubenko in 1993–2002.

Georgy Demyanovich Khorolskyi (born 1930) graduated from LVMI in 1954, then worked at OKB-586: Engineer, Head of Group in 1956, Head of Sector in 1960, Head of KB-5 in 1963, Head of Complex No. 8 in 1966, Deputy Main Engineer, Head of Construction Sector in 1969–1979, Chief Designer of RT-23 in 1979–1998, Head of Sector in 1998–2003, then built combine harvesters. Vladimir Ivanovich Kukushkin (born 1931) graduated from MAI in 1955, then joined OKB-586 where he became Head of KB-5 in 1966–1993. He became a Doctor of Technical Sciences and Professor in 1984. He was awarded the Order of the Red Banner of Labor on June 26, 1959, the Order of Lenin on June 17, 1961 and the Lenin Prize in 1976. Nikolai Stepanovich Golubenko (born 1936) graduated from the University of Dnepropetrovsk in 1959, joined the Votkinsk Plant, the Pavlograd Plant in 1962, Yuzhnoye in 1964, Head of KB-5 in 1993–2002, then designed wind turbines, State Prize in 1991. In 2002–2012, KB-5 was merged with KB-4. He then regained his autonomy under the direction of Anatoly Semenovich Kirichenko.

In May 2019, the Prize of the Cabinet of Ministers of Ukraine was awarded for "The Development of Complexes for Solid-Propellant Production and Rocket-Engine Testing" to six people from Yuzhnoye (including A.N. Mashenko and A.S. Kirichenko), two from the Pavlograd Mechanical Plant and two from the Pavlograd Chemical Plant.

Production of solid-propellant rockets was carried out in Pavlograd, near Dnepropetrovsk, as this was where there was a subsidiary of YuzhMash, which became the Pavlograd Mechanical Plant (PMZ) and Pavlograd Chemical Plant No. 55 (PKhZ). The first was headed successively by I.A. Sukhikh in 1961, V.M. Shkurenko in 1965, A.A. Romanov in 1995 and V.E. Kirichenko in 2007. Vitaly Mikhailovich Shkurenko (1929–1999) graduated from the University of Dnepropetrovsk in 1954, joined YuzhMash, then headed PMZ in 1965–1995. He was awarded the State Prize in 1977. As for PKhZ, it was headed successively by L.A. Fomenko in 1960, A.N. Shoshin in 1966, A.A. Shimanskyi in 1973, A.F. Romashkin in 1985, A.K. Lobov in 1987, V.S. Dudko in 1991 and L.N. Shiman in 2000. It produced the famous "Katyushas" during World War II, then castings for Nadiradze missiles (Temp-S, first and second stages of the 15J45 Pioneer, second and third stages of the RT-2PM Topol), Chelomei (Amestist, Malakhit, etc.) and Yangel (first, second and third stages of RT-23 Molodetz).

KB-6 (Devices and Actuators), which was Complex No. 6 in 1962–1967, was headed successively by F.F. Falunin in 1963–1971, S.M. Solodnikov in 1972–1991,

B.V. Dmitriyev in 1991–2008 and I.P. Babich in 2008. Fedor Fedorovich Falunin (1916–1971) graduated from MVTU in 1941, worked at Plant No. 37, evacuated to Sverdlovsk in 1941–1943, joined NII-88 in 1948, then moved to Plant No. 586 in 1951, where he took over the management of Complex No. 6 in 1963–1971. He became a Doctor of Technical Sciences in 1965, Professor at the University of Dnepropetrovsk. Stanislav Mikhailovich Solodnikov (1926–2001) graduated from MVTU in 1953, worked at Yuzhnoye, Head of Sector in 1954–1972, then Head of Complex in 1972–1991. He was awarded the State Prize in 1978. Boris Viktorovich Dmitriyev (born 1943) graduated from the University of Dnepropetrovsk in 1964, joined Yuzhnoye, Head of Sector in 1965–1991, then Head of Complex in 1991–2008.

Complex No. 2 for Ballistics, Aerodynamics and Guidance Systems was headed by N.F. Gerasyuta in 1962–1987, A.M. Podolinny in 1987–2008, then V.N. Sirenko in 2008. It was incorporated into KB-1 in 1968–1970, then again in May 1999 and January 2013. He also dealt with computer technology and decoys. In the 1990s, guidance systems, computer technology and decoys were transferred to other structures.

Nikolai Fedorovich Gerasyuta (1919–1987) graduated from the University of Odessa in 1941, then left for the Front until 1945. He participated in the recovery of German rockets in 1946–1947, then joined Korolev OKB-1 in 1947 where he dealt with flight dynamics. In 1951, he moved to OKB-586 where he was Head of the Ballistics Sector. He was awarded the Order of Lenin for R-12 in 1959 and the Hero of Socialist Labor Medal for R-14 in 1961. In 1962, he was Deputy Chief Designer for Guidance Systems. He was awarded the State Prize for R-36 in 1967. He was Technical Director of the Tsiklon-2/US-A satellite program and for this he was awarded the Lenin Prize in 1972. He was a Doctor of Technical Sciences in 1960, a Professor at the University of Dnepropetrovsk (Head of Chair No. 3 of the Faculty of Physics and Technology), Corresponding Member of the National Academy of Sciences of Ukraine in 1967. A.M. Podolinny (born 1940) graduated from the University of Dnepropetrovsk in 1961, joined OKB-586, Head of the Ballistics Sector in 1978–1987, then Head of Complex No. 2 in 1987–2008, State Prize in 1991, Order of the Red Banner of Labor in 1976. V.N. Sirenko (born 1948) graduated from the University of Dnepropetrovsk in 1971, joined OKB-586, Head of the Aerodynamics Sector, then Head of Complex No. 2 in 2008.

Complex No. 3 for Strength was headed successively by P.I. Nikitin in 1951–1990, Yu. K. Privarnikov in 1990–1994, Yu. G. Petushenko in 1993–2003, V.A. Petrushevskyi in 2003–2013, then V.M. Fedorov in 2013.

Pavel Ivanovich Nikitin (1916–1996) graduated from the Tula Mechanics Institute in 1946, Engineer at NII-88 in 1946–1951, dealt with Strength at OKB-586 from 1951 to 1993, Doctor of Technical Sciences, Professor, State Prize in 1969 and Correspondent of the National Academy of Sciences of Ukraine in 1982. Yuliy Konstantinovich Privarnikov (born 1938) graduated from the University of Dnepropetrovsk in 1960, joined OKB-586 as Head of Sector, then Head of Complex in 1990–1994. Doctor of Technical Sciences in 1984, he became a Professor. Yuriy Grigoriyevich Petushenko (born 1947) graduated from the University of Dnepropetrovsk in 1978, joined OKB-586 as Head of Sector, then Head of Complex in 1993–2003. Viktor Aleksandrovich Petrushevskyi (born 1936) graduated from the Institute of Railway Engineers in 1959, worked at Krasnoyarsk in 1959–1961, then joined Yuzhnoye in 1963, Deputy then Head of Complex in 2003–2013. His successor was Victor Mikhailovich Fedorov.

Complex No. 5 for flight tests was headed successively by L.P. Vasiliyev (?–1959) in 1955–1959, V.A. Kontsevoi (1924–1960) in 1959–1960, V.V. Grachev in 1960–1991, L.A. Gribachev in 1991–2001, V. M. Panfilov in 2001–2005, A.V. Agarkov in 2005, then S.A. Davydenko. Viktor Vasiliyevich Grachev (1923–1996) went to war, before studying at MVTU in 1945–1951. He joined Plant No. 586, then the OKB in 1954. In May 1955, he was the First Chief Designer of R-12 and was awarded the Order of Lenin in 1959. He was then Deputy for Testing until 1991. He was awarded the Hero of Socialist Labor Medal in 1961 for R-14, the Lenin Prize in 1967 for R-36, the Order of the October Revolution in 1971 and the State Prize in 1977. For his part, Leonid Alekseyevich Gribachev (1938–2021) was an Engineer in 1960, joined Yuzhnoye where he was Deputy in 1979–1991, Head of Complex in 1991–2001, then Deputy Head of Center in 2001. He was awarded the State Prize in 1982 and the Lenin Prize in 1990. Valery Mikhailovich Panfilov (born 1939) graduated from the Taganrog Radiotechnical Institute in 1966, joined OKB-586, Head of Sector, Head of Complex No. 6 in 1995–2001, then of Complex No. 5 in 2001–2005. In 2001, Complex Nos. 5 and 6 merged into Center No. 1 until 2005. The Head was A.V. Agarkov, and the Deputies V.M. Panfilov and A.L. Makarov. Then, Complex No. 5 was reformed in 2005 under the direction of Agarkov. Anatoly Vasiliyevich Agarkov (born 1949) graduated from the University of Dnepropetrovsk in 1976, joined Yuzhnoye where he was Chief Designer in 1984–1992, Deputy for General Matters in 1993–1996, Main Designer in 1996–2001, Deputy for Testing and Operation (Center No. 1) in 2001, then Head of Complex No. 5 in 2005. He was Chief Designer and Deputy Technical Director for the Zenit launcher, then Technical Director for Sea Launch. He was awarded the State Prize of Ukraine in 2002.

Complex No. 6 for Maintenance and Operations was created in 1969. It was headed successively by A.M. Kunshenko in 1969–1986, N.G. Leonshenko in 1986–1991, V.I. Sokol in 1991–1995 and V.M. Panfilov in 1995–2001. Anatoly

Mitrofanovich Kunshenko (1922–1986) graduated from the Kharkov Polytechnic Institute in 1951, worked at Plant No. 586 in 1951–1955, then moved on to OKB-586 in 1955–1986 (Head of Sector, Deputy Chief Designer for the operation of ICBMs in 1969–1986), State Prize in 1978 (third-generation ICBM warhead), Order of Lenin in 1970. Nikolai Gerasimovich Leonshenko (born 1930) graduated from VVIA in 1960, Military Representative in 1960–1982, Head of the Maintenance and Operation Complex in 1986–1991, State Prize 1990 and Order of Lenin in 1976. Vladimir Ivanovich Sokol (born 1947) graduated from the University of Dnepropetrovsk in 1971, Deputy in 1987, then Head of Complex in 1991–1995.

Complexes No. 7 and 8 dealt with the experimental basis and test benches. Complex No. 7 was headed by I.I. Kupchinskyi in 1967–1977 and V.V. Lazaryan in 1986–1992. Igor Ignatiyevich Kupchinskyi (1913–1992) graduated from LVMI in 1939, joined Yuzhnoye in 1955, Deputy Chief Designer in 1959–1967, Head of Complex in 1967–1977, State Prize in 1969. His successor was Vitaliy Vsevolodovich Lazaryan in 1986–1992. Complex No. 8 was headed successively by G.D. Khorolskyi in 1966–1968, V. Ya. Soloviyev in 1973–1992, V.G. Vasilin in 1992–1993, G.V. Shevchenko in 1993–1999, then A.N. Supenko in 1999. Valentin Yakovlevich Soloviyev (1931–1999) graduated from the Kazan Aviation Institute in 1955, joined OKB-586, Head of Sector in 1964, then Head of Complex in 1973–1992. Gennady Vladimirovitch Shevchenko (1937–1999) graduated from the University of Dnepropetrovsk in 1959, Deputy in 1992, then Head of Complex in 1993–1999. Anatoly Nikolayevich Supenko (born 1949) graduated from the University of Dnepropetrovsk in 1977, became Deputy in 1993, then Head of Complex in 1999.

Complex No. 9 for Materials was created in 1966. It was headed successively by M.A. Akhmechin in 1966–1983, V.G. Sitalo in 1983–2005, then A.M. Potapov in 2005. Mubarak Akhmetovich Akhmechin (1915–1990) graduated from the Ural Polytechnic Institute in Sverdlovsk in 1940, then the Academy of Armament Industry in 1950, worked at Plant No. 92 in 1940–1948, at SKB-385 in Zlatust in 1950–1957, at OKB-586 in 1957–1983 (Head of Complex in 1966–1983). Doctor of Technical Sciences in 1967, he was a Professor, then Lenin Prize winner in 1964. Vladimir Gavrilovich Sitalo (born 1935) graduated from the Chemical Technology Institute of Dnepropetrovsk in 1959, worked at the Dnepropetrovsk Design Institute in 1959–1962, joined OKB-586, became Deputy in 1981, then Head of Complex in 1983–2005. He was awarded the State Prize of Ukraine in 1993. Aleksandr Mikhailovich Potapov (born 1958) graduated from the Leningrad Technological Institute in 1981, joined OKB-586, was Head of Sector in 1986 (developing carbon–carbon elements of the 15J60 and 15J61 rockets), then Head of Complex in 2005. Lastly, Complex No. 10 dealt with Work Coordination and Organization.

1.4. Overview of 50 years of activity

In 50 years, Yuzhnoye launched 2,300 rockets, including 450 space launchers:

– *First-generation missiles*:

- 8K63/R-12: 905 launches with 97% success (LKI: 24) + 11K63/Kosmos: 167 launches;

- 8K65/R-14: 182 launches with 93% success (LKI: 22) + 11K65/Kosmos: Reshetnev/Poliot;

- 8K64/R-16: 307 launches with 91% success (LKI: 25).

– *Second-generation missiles*:

- 8K67/R-36: 146 launches (LKI: (85 with 83.6% success) + 11K67/11K69/ Cyclone-2: 102 launches;

- 8K69/R-36Orb: 19 launches;

- 11K68/Cyclone-3: 126 launches.

– *Third-generation missiles*:

- 15A14/R-36M: 95 launches;

- 15A15/MR-UR-100: 67 launches with 89.5% success (LKI: 40);

- 15A18/R-36MUTTKh: 62 launches with 90% success (LKI: 19);

- 15A16/MR-UR-100UTTKh: 25 launches with 88% success (LKI: 19);

- 15A11/Perimetr: seven launches with 85.7% success.

– *Fourth-generation missiles*:

- 15A18M/R-36M2: 33 launches with 97.4% success (LKI: 26) + Dnepr: 17 launches;

- 15J44/15J52: 18 launches including 8 × 15J44 (?) and 10 × 15J52 (one failure and two partial successes);

- 15J60/15J61: 37 launches (LKI: 26) including 16 × 15J61 (one failure) and 19 × 15J60 (3 failures).

– *Space launcher*: 11K77/Zenit: 36 launches + Sea Launch: 31 launches + Land Launch: nine launches.

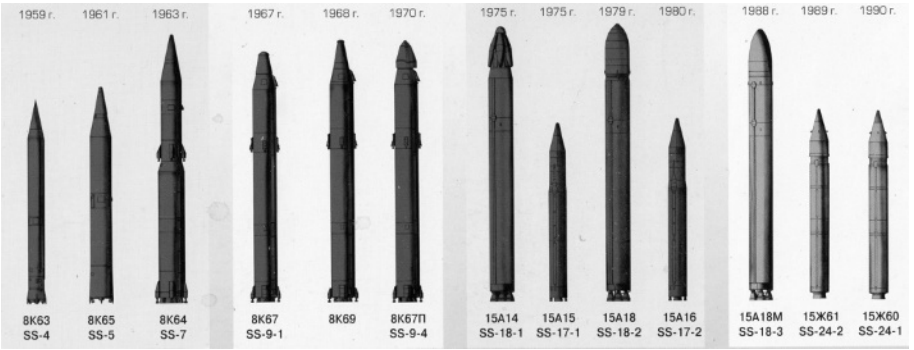
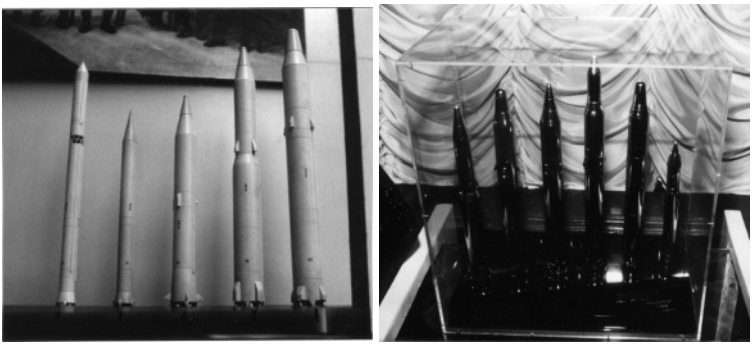


Figure 1.19. *OKB-586 rockets: from left to right, 8K63/R-12, 8K65/R-14, 8K64/R-16, 8K67/R-36, 8K69/R-36Orb, 8K67P/R-36P, 15A14/R-36M, 15A15/MR-UR-100, 15A18/R-36MUTTKh, 15A16/MR-UR-100UTTKh, 15A18M/R-36M2, 15J60/ RT-23UTTKh (silo), 15J61/RT-23UTTKh (rail) (source: Yuzhnoye)*



a) b)

Figure 1.20. *OKB-586 rockets: a) 11K63/Kosmos, 8K63/R-12, 8K65/R-14, 8K64/R-16, 8K67/R-36; b) 8K64/R-16, 8K67/R-36, 8K69/R-36Orb, 11K67/Tsiklon-2A, 15A14/R-36M, 15A15/MR-UR-100 (source: C. Lardier).*

1.5. Decorations awarded to OKB-586/Yuzhnoye

The company's successes were recognized by the following awards:

– April 20, 1956: Order of Lenin and Order of the Red Banner of Labor for R-5M.

– June 26, 1959: Hero of Socialist Labor, Order of Lenin and Order of the Red Banner of Labor for R-12.

– April 1960: Lenin Prize for R-12.

– April 1961: Lenin Prize for R-14.

– June 17, 1961: Hero of Socialist Labor, Order of Lenin and Order of the Red Banner of Labor for R-14.

– April 1964: Lenin Prize for R-16.

– 1967: Lenin Prize (April) and State Prize (November) for R-36.

– August 29, 1969: Hero of Socialist Labor, Order of Lenin for R-36Orb.

– November 1969: State Prize for R-36Orb.

– April 1970: Lenin Prize for the Meteor satellite.

– 1971: Decorations for the 8K67P/R-36P three-warhead missile.

– 1972: Lenin Prize (April) and State Prize (November) for the Tsiklon-2/US-A satellite.

– November 1973: State Prize for the Tselina-O satellite.

– 1976: Hero of Socialist Labor (March 29th), Lenin Prize (April) and State Prize (November) for third-generation ICBMs.

– 1977: Decorations for the Tselina-D satellite.

– November 1978: State Prize for the AUOS satellite.

– April 1980: Lenin Prize for Tsiklon-2/US-P satellite and Tsiklon-3/Tselina-D-Meteor-M.

– 1982: Hero of Socialist Labor (October), Lenin Prize (April) and State Prize (November) for third-generation ICBMs.

– 1984: Decorations for the Taifun calibration satellites.

– November 1986: State Prize for the Oreol-3 satellite.

– 1987: Decorations for the 15A11/Perimetr missile.

– 1988–1989: Lenin Prize (April) and State Prize (November) for R-36M2.

– 1990–1991: Hero of Socialist Labor (March) and State Prize (November) for R-36M2, Lenin Prize (April) and State Prize (November) for 11K77/Zenit, Lenin Prize (April) and State Prize (November) for RT-23.

– State Prize of Ukraine in 2003 for Dnepr.

– Prize of the Government of Russia in 2004 for Dnepr.

– State Prize of Ukraine in 2009 for the Sea Launch.

– State Prize of Ukraine in 2012 for the upper-stage engines of the Vega and Tsiklon-4 launchers.

– Prize of the Cabinet of Ministers of Ukraine in 2013 for the Antares launcher.

Details of the recipients can be found in various chapters of this book.