

Rockets *and* People



Boris E. Chertok

Rockets and People

Volume I

Much has been written in the West on the history of the Soviet space program but few Westerners have read direct first-hand accounts of the men and women who were behind the many Russian accomplishments in exploring space. The memoirs of Academician Boris Chertok, translated from the original Russian, fills that gap.

Chertok began his career as an electrician in 1930 at an aviation factory near Moscow. Twenty-seven years later, he became deputy to the founding figure of the Soviet space program, the mysterious “Chief Designer” Sergey Korolev. Chertok’s sixty-year-long career and the many successes and failures of the Soviet space program constitute the core of his memoirs, *Rockets and People*. In these writings, spread over four volumes, Academician Chertok not only describes and remembers, but also elicits and extracts profound insights from an epic story about a society’s quest to explore the cosmos.

In Volume 1, Chertok describes his early years as an engineer and ends with the mission to Germany after the end of World War II when the Soviets captured Nazi missile technology and expertise. Volume 2 takes up the story with the development of the world’s first intercontinental ballistic missile (ICBM) and ends with the launch of Sputnik and the early Moon probes. In Volume 3, Chertok recollects the great successes of the Soviet space program in the 1960s including the launch of the world’s first space voyager Yuriy Gagarin as well as many events connected with the Cold War. Finally, in Volume 4, Chertok meditates at length on the massive Soviet lunar project designed to beat the Americans to the Moon in the 1960s, ending with his remembrances of the Energiya–Buran project.

Cover photo

Standing (from right to left): Major B. Chertok, Major Musatov, Colonel N. Pilyugin, and officers of the Seventy-fifth Guards’ Division—Bleicherode, Germany, 1945. From the author’s archives.

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Volume I

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*I dedicate this book
to the cherished memory
of my wife and friend,
Yekaterina Semyonova Golubkina.*

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Series Introduction

IN AN EXTRAORDINARY CENTURY, Academician Boris Yevseyevich Chertok lived an extraordinary life. He witnessed and participated in many important technological milestones of the twentieth century, and in these volumes, he recollects them with clarity, humanity, and humility. Chertok began his career as an electrician in 1930 at an aviation factory near Moscow. Thirty years later, he was one of the senior designers in charge of the Soviet Union's crowning achievement as a space power: the launch of Yuriy Gagarin, the world's first space voyager. Chertok's sixty-year-long career, punctuated by the extraordinary accomplishments of both Sputnik and Gagarin, and continuing to the many successes and failures of the Soviet space program, constitutes the core of his memoirs, *Rockets and People*. In these four volumes, Academician Chertok not only describes and remembers, but also elicits and extracts profound insights from an epic story about a society's quest to explore the cosmos.

Academician Chertok's memoirs, forged from experience in the Cold War, provide a compelling perspective into a past that is indispensable to understanding the present relationship between the American and Russian space programs. From the end of the World War II to the present day, the missile and space efforts of the United States and the Soviet Union (and now, Russia) have been inextricably linked. As such, although Chertok's work focuses exclusively on Soviet programs to explore space, it also prompts us to reconsider the entire history of spaceflight, both Russian and American.

Chertok's narrative underlines how, from the beginning of the Cold War, the rocketry projects of the two nations evolved in independent but parallel paths. Chertok's first-hand recollections of the extraordinary Soviet efforts to collect, catalog, and reproduce German rocket technology after World War II provide a parallel view to what historian John Gimbel has called the Western "exploitation and plunder" of German technology after the war.¹ Chertok describes how the Soviet design team under the famous Chief Designer Sergey Pavlovich Korolev

1. John Gimbel, *Science, Technology, and Reparations: Exploitation and Plunder in Postwar Germany* (Stanford: Stanford University Press, 1990).

quickly outgrew German missile technology. By the late 1950s, his team produced the majestic R-7, the world's first intercontinental ballistic missile. Using this rocket, the Soviet Union launched the first Sputnik satellite on 4 October 1957 from a launch site in remote central Asia.

The early Soviet accomplishments in space exploration, particularly the launch of Sputnik in 1957 and the remarkable flight of Yuriy Gagarin in 1961, were benchmarks of the Cold War. Spurred by the Soviet successes, the United States formed a governmental agency, the National Aeronautics and Space Administration (NASA), to conduct civilian space exploration. As a result of Gagarin's triumphant flight, in 1961, the Kennedy Administration charged NASA to achieve the goal of "landing a man on the Moon and returning him safely to the Earth before the end of the decade."² Such an achievement would demonstrate American supremacy in the arena of spaceflight at a time when both American and Soviet politicians believed that victory in space would be tantamount to preeminence on the global stage. The space programs of both countries grew in leaps and bounds in the 1960s, but the Americans crossed the finish line first when Apollo astronauts Neil A. Armstrong and Edwin E. "Buzz" Aldrin, Jr. disembarked on the Moon's surface in July 1969.

Shadowing Apollo's success was an absent question: What happened to the Soviets who had succeeded so brilliantly with Sputnik and Gagarin? Unknown to most, the Soviets tried and failed to reach the Moon in a secret program that came to naught. As a result of that disastrous failure, the Soviet Union pursued a gradual and consistent space station program in the 1970s and 1980s that eventually led to the Mir space station. The Americans developed a reusable space transportation system known as the Space Shuttle. Despite their seemingly separate paths, the space programs of the two powers remained dependent on each other for rationale and direction. When the Soviet Union disintegrated in 1991, cooperation replaced competition as the two countries embarked on a joint program to establish the first permanent human habitation in space through the International Space Station (ISS).

Academician Chertok's reminiscences are particularly important because he played key roles in almost every major milestone of the Soviet missile and space programs, from the beginning of World War II to the dissolution of the Soviet Union in 1991. During the war, he served on the team that developed the Soviet Union's first rocket-powered airplane, the BI. In the immediate aftermath of the war, Chertok, then in his early thirties, played a key role in studying and collecting captured German rocket technology. In the latter days of the Stalinist era, he worked to develop long-range missiles as deputy chief engineer of the main research institute, the NII-88 (pronounced "nee-88") near Moscow. In 1956,

2. U.S. Congress, *Senate Committee on Aeronautical and Space Sciences, Documents on International Aspects of the Exploration and Uses of Outer Space, 1954-1962, 88th Cong., 1st sess., S. Doc. 18* (Washington, DC: GPO, 1963), pp. 202-204.

Korolev's famous OKB-1 design bureau spun off from the institute and assumed a leading position in the emerging Soviet space program. As a deputy chief designer at OKB-1, Chertok continued with his contributions to the most important Soviet space projects of the day: Vostok, Voskhod, Soyuz, the world's first space station Salyut, the Energiya superbooster, and the Buran space shuttle.

Chertok's emergence from the secret world of the Soviet military-industrial complex, into his current status as the most recognized living legacy of the Soviet space program, coincided with the dismantling of the Soviet Union as a political entity. Throughout most of his career, Chertok's name remained a state secret. When he occasionally wrote for the public, he used the pseudonym "Boris Yevseyev."³ Like others writing on the Soviet space program during the Cold War, Chertok was not allowed to reveal any institutional or technical details in his writings. What the state censors permitted for publication said little; one could read a book several hundred pages long comprised of nothing beyond tedious and long personal anecdotes between anonymous participants extolling the virtues of the Communist Party. The formerly immutable limits on free expression in the Soviet Union irrevocably expanded only after Mikhail Gorbachev's rise to power in 1985 and the introduction of *glasnost*' (openness).

Chertok's name first appeared in print in the newspaper *Izvestiya* in an article commemorating the thirtieth anniversary of the launch of Sputnik in 1987. In a wide-ranging interview on the creation of Sputnik, Chertok spoke with the utmost respect for his former boss, the late Korolev. He also eloquently balanced love for his country with criticisms of the widespread inertia and inefficiency that characterized late-period Soviet society.⁴ His first written works in the *glasnost*' period, published in early 1988 in the Air Force journal *Aviatsiya i kosmonavtika* (Aviation and Cosmonautics), underlined Korolev's central role in the foundation and growth of the Soviet space program.⁵ By this time, it was as if all the patched up straps that held together a stagnant empire were falling apart one by one; even as Russia was in the midst of one of its most historic transformations, the flood-gates of free expression were transforming the country's own history. People like Chertok were now free to speak about their experiences with candor. Readers could now learn about episodes such as Korolev's brutal incarceration in the late 1930s, the dramatic story behind the fatal space mission of Soyuz-1 in 1967, and details of the failed and abandoned Moon project in the 1960s.⁶ Chertok himself

3. See for example, his article "Chelovek or avtomat?" (Human or Automation?) in the book by M. Vasilyev, ed., *Shagi k zvezdam* (Footsteps to the Stars) (Moscow: Molodaya gvardiya, 1972), pp. 281–287.

4. B. Konovalov, "Ryvok k zvezdam" (Dash to the Stars), *Izvestiya*, October 1, 1987, p. 3.

5. B. Chertok, "Lider" (Leader), *Aviatsiya i kosmonavtika* no. 1 (1988): pp. 30–31 and no. 2 (1988): pp. 40–41.

6. For early references to Korolev's imprisonment, see Ye. Manucharova, "Kharakter glavnogo konstruktora" (The Character of the Chief Designer), *Izvestiya*, January 11, 1987, p. 3. For early revelations on Soyuz-1 and the Moon program, see L. N. Kamanin, "Zvezdy Komarova" (Komarov's Star), *Poisk* No. 5 (June 1989): pp. 4–5 and L. N. Kamanin, "S zemli na lunu i obratno" (From the Earth to the Moon and Back), *Poisk* no. 12 (July 1989): pp. 7–8.

shed light on a missing piece of history in a series of five articles published in *Izvestiya* in early 1992 on the German contribution to the foundation of the Soviet missile program after World War II.⁷

Using these works as a starting point, Academician Chertok began working on his memoirs. Originally, he had only intended to write about his experiences from the postwar years in one volume, maybe two. Readers responded so positively to the first volume, *Rakety i lyudi* (Rockets and People) published in 1994, that Chertok continued to write, eventually producing four substantial volumes, published in 1996, 1997, and 1999, covering the entire history of the Soviet missile and space programs.⁸

My initial interest in the memoirs was purely historical: I was fascinated by the wealth of technical arcana in the books, specifically projects and concepts that had remained hidden throughout much of the Cold War. Those interested in dates, statistics, and the “nuts and bolts” of history will find much that is useful in these pages. As I continued to read, however, I became engrossed by the overall rhythm of Academician Chertok’s narrative, which gave voice and humanity to a story ostensibly about mathematics and technology. In his writings, I found a richness that had been nearly absent in most of the disembodied, clinical, and often speculative writing by Westerners studying the Soviet space program. Because of Chertok’s story-telling skills, his memoir is a much needed corrective to the outdated Western view of Soviet space achievements as a mishmash of propaganda, self-delusion, and Cold War rhetoric. In Chertok’s story, we meet real people with real dreams who achieved extraordinary successes under very difficult conditions.

Chertok’s reminiscences are remarkably sharp and descriptive. In being self-reflective, Chertok avoids the kind of solipsistic ruminations that often characterize memoirs. He is both proud of his country’s accomplishments and willing to admit failings with honesty. For example, Chertok juxtaposes accounts of the famous aviation exploits of Soviet pilots in the 1930s, especially those to the Arctic, with the much darker costs of the Great Terror in the late 1930s when Stalin’s vicious purges decimated the Soviet aviation industry.

7. *Izvestiya* correspondent Boris Konovalov prepared these publications, which had the general title “U Sovetskikh raketnykh triumfov bylo nemetskoye nachalo” (Soviets Rocket Triumphs Had German Origins). See *Izvestiya*, March 4, 1992, p. 5; March 5, 1992, p. 5; March 6, 1992, p. 5; March 7, 1992, p. 5; and March 9, 1992, p. 3. Konovalov also published a sixth article on the German contribution to American rocketry. See “U amerikanskikh raketnykh triumfov takzhe bylo nemetskoye nachalo” (American Rocket Triumphs Also Had German Origins), *Izvestiya*, March 10, 1992, p. 7. Konovalov later synthesized the five original articles into a longer work that included the reminiscences of other participants in the German mission such as Vladimir Barmin and Vasilii Mishin. See Boris Konovalov, *Tayna Sovetskogo raketnogo oruzhiya* (Secrets of Soviet Rocket Armaments) (Moscow: ZEVS, 1992).

8. *Rakety i lyudi* (Rockets and People) (Moscow: Mashinostroyeniye, 1994); *Rakety i lyudi: Fili Podlipki Tyuratam* (Rockets and People: Fili Podlipki Tyuratam) (Moscow: Mashinostroyeniye, 1996); *Rakety i lyudi: goryachiye dni kholodnoy voyny* (Rockets and People: Hot Days of the Cold War) (Moscow: Mashinostroyeniye, 1997); *Rakety i lyudi: lunnaya gonka* (Rockets and People: The Moon Race) (Moscow: Mashinostroyeniye, 1999). All four volumes were subsequently translated and published in Germany.

Chertok's descriptive powers are particularly evident in describing the chaotic nature of the Soviet mission to recover and collect rocketry equipment in Germany after World War II. Interspersed with his contemporary diary entries, his language conveys the combination of joy, confusion, and often anti-climax that the end of the war presaged for Soviet representatives in Germany. In one breath, Chertok and his team are looking for hidden caches of German matériel in an underground mine, while in another they are face to face with the deadly consequences of a soldier who had raped a young German woman (chapter 22).⁹ There are many such seemingly incongruous anecdotes during Chertok's time in Germany, from the experience of visiting the Nazi slave labor camp at Dora soon after liberation in 1945, to the deportation of hundreds of German scientists to the USSR in 1946. Chertok's massive work is of great consequence for another reason—he cogently provides context. Since the breakup of the Soviet Union in 1991, many participants have openly written about their experiences, but few have successfully placed Soviet space achievements in the broader context of the history of Soviet science, the history of the Soviet military-industrial complex, or indeed Soviet history in general.¹⁰ The volumes of memoirs compiled by the Russian State Archive of Scientific-Technical Documentation in the early 1990s under the series, *Dorogi v kosmos* (Roads to Space), provided an undeniably rich and in-depth view of the origins of the Soviet space program, but they were, for the most part, personal narratives, i.e., fish-eye views of the world around them.¹¹ Chertok's memoirs are a rare exception in that they strive to locate the Soviet missile and space program in the fabric of broader social, political, industrial, and scientific developments in the former Soviet Union.

This combination—Chertok's participation in the most important Soviet space achievements, his capacity to lucidly communicate them to the reader, and

9. For the problem of rape in occupied Germany after the war, see Norman M. Naimark, *The Russians in Germany: A History of the Soviet Zone of Occupation, 1945–1949* (Cambridge, MA: The Belknap Press of Harvard University Press, 1995), pp. 69–140.

10. For the two most important histories of the Soviet military-industrial complex, see N. S. Simonov, *Voyenno-promyshlennyi kompleks SSSR v 1920-1950-ye gody: tempy ekonomicheskogo rosta, struktura, organizatsiya proizvodstva i upravleniye* (The Military-Industrial Complex of the USSR in the 1920s to 1950s: Rate of Economic Growth, Structure, Organization of Production and Control) (Moscow: ROSSPEN, 1996); and I.V. Bystrova, *Voyenno-promyshlennyi kompleks sssr v gody kholodnoy voyny (vtoraya polovina 40-kh – nachalo 60-kh godov)* [The Military-Industrial Complex of the USSR in the Years of the Cold War (The Late 1940s to the Early 1960s)] (Moscow: IRI RAN, 2000). For a history in English that builds on these seminal works and complements them with original research, see John Barber and Mark Harrison, eds., *The Soviet Defence-Industry Complex from Stalin to Khrushchev* (Houndmills, UK: Macmillan Press, 2000).

11. Yu. A. Mozzhorin et al., eds., *Dorogi v kosmos: Vospominaniya veteranov raketno-kosmicheskoy tekhniki i kosmonavtiki, tom I i II* (Roads to Space: Recollections of Veterans of Rocket-Space Technology and Cosmonautics: Volumes I and II) (Moscow: MAI, 1992) and Yu. A. Mozzhorin et al., eds., *Nachalo kosmicheskoy ery: vospominaniya veteranov raketno-kosmicheskoy tekhniki i kosmonavtiki: vypusk vtoroy* (The Beginning of the Space Era: Recollections of Veterans of Rocket-Space Technology and Cosmonautics: Second Issue) (Moscow: RNITsKD, 1994). For a poorly translated and edited English version of the series, see John Rhea, ed., *Roads to Space: An Oral History of the Soviet Space Program* (New York: Aviation Week Group, 1995).

his skill in providing a broader social context—make this work, in my opinion, one of the most important memoirs written by a veteran of the Soviet space program. The series will also be an important contribution to the history of Soviet science and technology.¹²

In reading Academician Chertok's recollections, we should not lose sight of the fact that these chapters, although full of history, have their particular perspective. In conveying to us the complex vista of the Soviet space program, he has given us one man's memories of a huge undertaking. Other participants of these very same events will remember things differently. Soviet space history, like any discipline of history, exists as a continuous process of revision and restatement. Few historians in the twenty-first century would claim to be completely objective.¹³ Memoirists would make even less of a claim to the "truth." In his introduction, Chertok acknowledges this, saying, "I . . . must warn the reader that in no way do I have pretensions to the laurels of a scholarly historian. Correspondingly, my books are not examples of strict historical research. In any memoirs, narrative and thought are inevitably subjective." Chertok ably illustrates, however, that avoiding the pursuit of scholarly history does not necessarily lessen the relevance of his story, especially because it represents the opinion of an influential member of the postwar scientific and technical intelligentsia in the Soviet Union.

Some, for example, might not share Chertok's strong belief in the power of scientists and engineers to solve social problems, a view that influenced many who sought to transform the Soviet Union with modern science after the Russian Revolution in 1917. Historians of Soviet science such as Loren Graham have argued that narrowly technocratic views of social development cost the Soviet Union dearly.¹⁴ Technological hubris was, of course, not unique to the Soviet scientific community, but absent democratic processes of accountability, many huge Soviet government projects—such as the construction of the Great Dnepr Dam and the great Siberian railway in the 1970s and 1980s—ended up as costly failures with many adverse social and environmental repercussions. Whether one agrees or disagrees with Chertok's views, they are important to understand because they represent the ideas of a generation who passionately believed in the power of science to eliminate the ills of society. As such, his memoirs add an important

12. For key works on the history of Soviet science and technology, see Kendall E. Bailes, *Technology and Society under Lenin and Stalin: Origins of the Soviet Technical Intelligentsia, 1917–1941* (Princeton, NJ: Princeton University Press, 1978); Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge: Cambridge University Press, 1993); and Nikolai Kremetsov, *Stalinist Science* (Princeton, NJ: Princeton University Press, 1997).

13. For the American historical discipline's relationship to the changing standards of objectivity, see Peter Novick, *That Noble Dream: The 'Objectivity' Question and the American Historical Profession* (Cambridge, UK: Cambridge University Press, 1988).

14. For technological hubris, see for example, Loren Graham, *The Ghost of the Executed Engineer: Technology and the Fall of the Soviet Union* (Cambridge, MA: Harvard University Press, 1993).

dimension to understanding the *mentalité* of the Soviets' drive to become a modern, industrialized state in the twentieth century.

Chertok's memoirs are part of the second generation of publications on Soviet space history, one that eclipsed the (heavily censored) first generation published during the Communist era. Memoirs constituted a large part of the second generation. In the 1990s, when it was finally possible to write candidly about Soviet space history, a wave of personal recollections flooded the market. Not only Boris Chertok, but also such luminaries as Vasilii Mishin, Kerim Kerimov, Boris Gubanov, Yuriy Mozzhorin, Konstantin Feoktistov, Vyacheslav Filin, and others finally published their reminiscences.¹⁵ Official organizational histories and journalistic accounts complemented these memoirs, written by individuals with access to secret archival documents. Yaroslav Golovanov's magisterial *Korolev: Fakty i Mify* (Korolev: Facts and Myths), as well as key institutional works from the Energiya corporation and the Russian Military Space Forces, added richly to the canon.¹⁶ The diaries of Air Force General Nikolay Kamanin from the 1960s to the early 1970s, published in four volumes in the late 1990s, also gave scholars a candid look at the vicissitudes of the Soviet human spaceflight program.¹⁷

The flood of works in Russian allowed Westerners to publish the first works in English. Memoirs—for example, from Sergey Khrushchev and Roald Sagdeev—appeared in their English translations. James Harford published his 1997 biography of Sergey Korolev based upon extensive interviews with veterans of the Soviet space program.¹⁸ My own book, *Challenge to Apollo: The Soviet Union and the Space*

15. V. M. Filin, *Vospominaniya o lunnom korablye* (Recollections on the Lunar Ship) (Moscow: Kultura, 1992); Kerim Kerimov, *Dorogi v kosmos (zapiski predsedatelya Gosudarstvennoy komissii)* [Roads to Space (Notes of the Chairman of the State Commission)] (Baku: Azerbaijan, 1995); V. M. Filin, *Put k 'Energii'* (Path to Energiya) (Moscow: Izdatelskiy Dom 'GRAAL', 1996); V. P. Mishin, *Ot sozdaniya ballisticheskikh raket k raketno-kosmicheskomu mashinostroyeniyu* (From the Creation of the Ballistic Rocket to Rocket-Space Machine Building) (Moscow: Informatsionno-izdatelskiy tsentr 'Inform-Znaniye,' 1998); B. I. Gubanov, *Triumf i tragediya 'energii': razmyshleniya glavnogo konstruktora* (The Triumph and Tragedy of Energiya: The Reflections of a Chief Designer) (Nizhniy novgorod: NIER, four volumes in 1998–2000); Konstantin Feoktistov, *Trayektoriya zhizni: mezhdu vchera i zavtra* (Life's Trajectory: Between Yesterday and Tomorrow) (Moscow: Vagrius, 2000); N. A. Anifimov, ed., *Tak eto bylo—Memuary Yu. A. Mozzhorin: Mozzhorin v vospominaniyakh sovremennikov* (How it Was—Memoirs of Yu. A. Mozzhorin: Mozzhorin in the Recollections of his Contemporaries) (Moscow: ZAO 'Mezhdunarodnaya programma obrazovaniya, 2000).

16. Yaroslav Golovanov, *Korolev: fakty i mify* (Korolev: Facts and Myths) (Moscow: Nauka, 1994); Yu. P. Semenov, ed., *Raketno-Kosmicheskaya Korporatsiya "Energiya" imeni S. P. Koroleva* (Energiya Rocket-Space Corporation Named After S. P. Korolev) (Korolev: RKK Energiya, 1996); V. V. Favorskiy and I. V. Meshcheryakov, eds., *Voyenno-kosmicheskkiye sily (voenno-istoricheskii trud): kniga I* [Military-Space Forces (A Military-Historical Work): Book I] (Moscow: VKS, 1997). Subsequent volumes were published in 1998 and 2001.

17. The first published volume was N. P. Kamanin, *Skrytiy kosmos: kniga pervaya, 1960–1963gg.* (Hidden Space: Book One, 1960–1963) (Moscow: Infortekst IF, 1995). Subsequent volumes covering 1964–1966, 1967–1968, and 1969–1978 were published in 1997, 1999, and 2001 respectively.

18. Sergei N. Khrushchev, *Nikita Khrushchev and the Creation of a Superpower* (University Park, PA: The Pennsylvania State University Press, 2000); Roald Z. Sagdeev, *The Making of a Soviet Scientist: My Adventures in Nuclear Fusion and Space From Stalin to Star Wars* (New York: John Wiley & Sons, 1993); James Harford, *Korolev: How One Man Masterminded the Soviet Drive to Beat America to the Moon* (New York: John Wiley & Sons, 1997).

Race, 1945–1974, was an early attempt to synthesize the wealth of information and narrate a complete history of the early Soviet human spaceflight program.¹⁹ Steven Zaloga provided an indispensable counterpoint to these space histories in *The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945–2000*, which reconstructed the story of the Soviet efforts to develop strategic weapons.²⁰

With any new field of history that is bursting with information based primarily on recollection and interviews, there are naturally many contradictions and inconsistencies. For example, even on such a seemingly trivial issue as the name of the earliest institute in Soviet-occupied Germany, “Institute RABE,” there is no firm agreement on the reason it was given this title. Chertok’s recollections contradict the recollection of another Soviet veteran, Georgiy Dyadin.²¹ In another case, many veterans have claimed that artillery general Lev Gaydukov’s meeting with Stalin in 1945 was a key turning point in the early Soviet missile program; Stalin apparently entrusted Gaydukov with the responsibility to choose an industrial sector to assign the development of long-range rockets (chapter 23). Lists of visitors to Stalin’s office during that period—declassified only very recently—do not, however, show that Gaydukov ever met with Stalin in 1945.²² Similarly, many Russian sources note that the “Second Main Directorate” of the USSR Council of Ministers managed Soviet missile development in the early 1950s, when in fact, this body actually supervised uranium procurement for the A-bomb project.²³ In many cases, memoirs provide different and contradictory information on the very same event (different dates, designations, locations, people involved, etc.).

Academician Chertok’s wonderful memoirs point to a solution to these discrepancies: a “third generation” of Soviet space history, one that builds on the rich trove of the first and second generations, but is primarily based on *documentary* evidence. During the Soviet era, historians could not write history based on documents since they could not obtain access to state and design bureau archives. As the Soviet Union began to fall apart, historians such as Georgiy Vetrov began to take the first steps in document-based history. Vetrov, a former engineer at

19. Asif A. Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945–1974* (Washington, D.C.: NASA SP-2000-4408, 2000). The book was republished as a two-volume work as *Sputnik and the Soviet Space Challenge* (Gainesville, FL: University Press of Florida, 2003) and *The Soviet Space Race with Apollo* (Gainesville, FL: University Press of Florida, 2003).

20. Steven J. Zaloga, *The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945–2000* (Washington, DC: Smithsonian Institution Press, 2002).

21. G. V. Dyadin, D. N. Filippovych, and V. I. Ivkin, *Pamyatnyye starty* (Memorable Launches) (Moscow: TsIPK, 2001), p. 69.

22. A. V. Korotkov, A. D. Chernev, and A. A. Chernobayev, “Alfavitnyi ukazatel posetitelei kremlevskogo kabineta I. V. Stalina” (“Alphabetical List of Visitors to the Kremlin Office of I. V. Stalin”), *Istoricheskii arkhiv* no. 4 (1998): p. 50.

23. Vladislav Zubok and Constantine Pleshakov, *Inside the Kremlin's Cold War: From Stalin to Khrushchev* (Cambridge, MA: Harvard University Press), p. 172; Golovanov, *Korolev*, p. 454. For the correct citation on the Second Main Directorate, established on December 27, 1949, see Simonov, *Voyenno-promyshlennyy kompleks sssr*, pp. 225–226.

Korolev's design bureau, eventually compiled and published two extraordinary collections of primary documents relating to Korolev's legacy.²⁴ Now that all the state archives in Moscow—such as the State Archive of the Russian Federation (GARF), the Russian State Archive of the Economy (RGAE), and the Archive of the Russian Academy of Sciences (ARAN)—are open to researchers, more results of this “third generation” are beginning to appear. German historians such as Matthias Uhl and Cristoph Mick and those in the United States such as myself have been fortunate to work in Russian archives.²⁵ For example, we no longer have to guess about the government's decision to approve development of the Soyuz spacecraft, we can see the original VPK decree issued on 4 December 1963.²⁶ Similarly, instead of speculating about the famous decree of 3 August 1964 that committed the Soviet Union to compete with the American Apollo program, we can study the actual government document issued on that date.²⁷ Academician Chertok deserves much credit for opening the doors for future historians, since his memoirs have guided many to look even deeper.

BECAUSE OF THE IMPORTANCE of Academician Chertok's memoirs, I did not hesitate when Acting Chief of the NASA History Division Stephen Garber invited me to serve as project editor for the English-language version. Jesco von Puttkamer, a veteran of the Huntsville team founded by Wernher von Braun, served as the guiding spirit behind the entire project. He was instrumental in setting up the arrangements for cooperation between the two parties; without his passion and enthusiasm for bringing Chertok's writings to a broader audience, this endeavor might not have gone beyond conception. Once the project was initiated, I was excited to learn that Academician Chertok would be providing entirely *new* chap-

24. M. V. Keldysh, ed., *Tvorcheskoye naslediyе Akademika Sergeya Pavlovicha Koroleva: izbrannyye trudy i dokumenty* (The Creative Legacy of Sergey Pavlovich Korolev: Selected Works and Documents) (Moscow: Nauka, 1980); G. S. Vetrov and B. V. Raushenbakh, eds., *S. P. Korolev i ego delo: svet i teni v istorii kosmonavtiki: izbrannyye trudy i dokumenty* (S. P. Korolev and His Cause: Shadow and Light in the History of Cosmonautics) (Moscow: Nauka, 1998). For two other published collections of primary documents, see V. S. Avduyevskiy and T. M. Eneyev, eds. *M. V. Keldysh: izbrannyye trudy: raketnaya tekhnika i kosmonavtika* (M. V. Keldysh: Selected Works: Rocket Technology and Cosmonautics) (Moscow: Nauka, 1988); B. V. Raushenbakh, ed., *Materialy po istorii kosmicheskogo korablya 'vostok': k 30-letiyu pervogo poleta cheloveka v kosmicheskoye prostranstvo* (Materials on the History of the 'Vostok' Space Ship: On the 30th Anniversary of the First Flight of a Human in Space) (Moscow: Nauka, 1991).

25. Matthias Uhl, *Stalins V-2: Der Technologietransfer der deutschen Fernlenkwaffentechnik in die UdSSR und der Aufbau der sowjetischen Raketenindustrie 1945 bis 1959* (Bonn, Germany: Bernard & Graefe-Verlag, 2001); Christoph Mick, *Forschen für Stalin: Deutsche Fachleute in der sowjetischen Rüstungsindustrie 1945-1958* (Munich: R. Oldenbourg, 2000); Asif A. Siddiqi, "The Rockets' Red Glare: Spaceflight and the Russian Imagination, 1857-1957," Ph.D. dissertation, Carnegie Mellon University, 2004.

26. "O sozdanii kompleksa 'Soyuz'" (On the Creation of the Soyuz Complex), December 4, 1963, RGAE, f. 298, op. 1, d. 3495, ll. 167-292.

27. "Tsentralnyy komitet KPSS i Sovet ministrov SSSR, postanovleniye" (Central Committee KPSS and SSSR Council of Ministers Decree), August 3, 1964, RGAE, f. 29, op. 1, d. 3441, ll. 299-300. For an English-language summary, see Asif A. Siddiqi, "A Secret Uncovered: The Soviet Decision to Land Cosmonauts on the Moon," *Spaceflight* 46 (2004): pp. 205-213.

ters for most of the four volumes, updated and corrected from the original Russian-language editions. In that sense, these English-language versions are the most updated and final versions of Chertok's memoirs.

As editor, my work was not to translate, a job that was very capably done by a team at the award-winning TechTrans International, Inc. (TTI) based in Houston, Texas. At TTI, Documents Control Manager Delila Rollins and Elena Sukholutsky expertly and capably supervised the very large project. Cynthia Reiser, Laurel Nolen, and Lydia Bryans worked on the actual translations with skill, insight, and good humor. With the translations in hand, my job was first and foremost to ensure that the English language version was as faithful to Chertok's vision as possible. At the same time, I also had to account for stylistic considerations for English-language readers who might be put off by literal translations. The process involved communicating directly with Chertok in many cases, and with his permission, taking liberties to restructure paragraphs and chapters to convey his original spirit. I also provided many explanatory footnotes to elucidate points that might not be evident to readers unversed in the intricacies of Russian history.

Many at NASA Headquarters contributed to publication of the memoirs. Steve Garber at the NASA History Office managed the project from beginning to end. I personally owe a debt of gratitude to Steve for his insightful comments throughout the editorial process. We must also thank Steven J. Dick, the current NASA Chief Historian, as well as Nadine J. Andreassen, William P. Barry, Todd McIntyre, and Claire Rojstaczer for all their terrific help. In the Printing and Design Office, Wes Horne expertly copyedited this book, Paul Clements skillfully laid it out, and Jeffrey McLean carefully saw it through the printing process.

I would also like to thank Dmitry Pieson in Moscow for graciously assisting in my communications with Academician Chertok, and Dr. Matthias Uhl for images of German rockets.

Please note that all footnotes in this volume are mine unless specifically noted as "author's footnotes."

A note about the division of material in the volumes. Because of significant additions and corrections, Academician Chertok has altered somewhat the distribution of materials. The English language edition follows a more-or-less sequential narrative storyline rather than one that goes back-and-forth in time. In the first English volume, he describes his childhood, his formative years as an engineer at the aviation Plant No. 22 in Fili, his experiences during World War II, and the mission to Germany in 1945–46 to study captured German missile technology.

In the second volume, he continues the story with his return to the Soviet Union, the reproduction of a Soviet version of the German V-2 and the development of a domestic Soviet rocket industry at the famed NII-88 institute in the Moscow suburb of Podlipki (now called Korolev). He describes the development of the world's first intercontinental ballistic missile, the R-7; the launch of Sputnik; and the first generation probes sent to the Moon.

In the third volume, he describes the historical launch of the first cosmonaut, Yuriy Gagarin. He also discusses several different aspects of the burgeoning Soviet missile and space programs of the early 1960s, including the development of early ICBMs, reconnaissance satellites, the Cuban missile crisis, the first Soviet communications satellite Molniya-1, the early spectacular missions of the Vostok and Voskhod programs, the dramatic Luna program to land a probe on the Moon, and Sergey Korolev's last days. He then continues into chapters about the early development of the Soyuz spacecraft, with an in-depth discussion of the tragic mission of Vladimir Komarov.

The fourth and final volume is mostly devoted to the Soviet project to send cosmonauts to the Moon in the 1960s, covering all aspects of the development of the giant N-1 rocket. The last portion of this volume covers the origins of the Salyut and Mir space station programs, ending with a fascinating description of the massive Energiya-Buran project, developed as a countermeasure to the American Space Shuttle.

IT WAS MY GREAT FORTUNE to meet with Academician Chertok in the summer of 2003. During the meeting, Chertok, a sprightly ninety-one years old, spoke passionately and emphatically about his life's work and remained justifiably proud of the achievements of the Russian space program. As I left the meeting, I was reminded of something that Chertok had said in one of his first public interviews in 1987. In describing the contradictions of Sergey Korolev's personality, Chertok had noted: "This realist, this calculating, [and] farsighted individual was, in his soul, an incorrigible romantic."²⁸ Such a description would also be an apt encapsulation of the contradictions of the entire Soviet drive to explore space, one which was characterized by equal amounts of hard-headed realism and romantic idealism. Academician Boris Yevseyevich Chertok has communicated that idea very capably in his memoirs, and it is my hope that we have managed to do justice to his own vision by bringing that story to an English-speaking audience.

ASIF A. SIDDIQI
Series Editor
July 2004

28. Konovalov, "Ryvok k zvezdam."

Foreword

AFTER YEARS OF BEING BEATEN TO THE PUNCH by our Soviet counterparts during the space race, those of us flying in the Gemini program wondered why the Soviets did not seem to be responding to the string of Gemini successes in the mid-1960s. Aleksei Leonov, my counterpart in 1975 as the Russian commander of the Apollo-Soyuz Test Project (ASTP), had shaken up our early plans for Gemini by conducting the first spacewalk, what we refer to as extravehicular activity (EVA), in March 1965. But after Aleksei's EVA, the Soviet space program was curiously inactive. We flew increasingly long-duration missions. We perfected rendezvous and docking, and practiced the EVA skills we would need for the Apollo missions to the Moon. We were sure the Russians were still in the race to the Moon—but they weren't doing what they needed to do to get there. The entire world knew our intentions, but there no longer appeared to be a Soviet effort to upstage our missions. What was going on?

After the Leonov EVA, there were no Soviet manned missions for over two years. In April 1967, the Soviets unveiled a new spacecraft called Soyuz. Despite the long preparations and all of the past Soviet successes, the first Soyuz mission was a disaster. It lasted only seventeen orbits, and cosmonaut Vladimir Komarov was killed when his Soyuz descent module malfunctioned during re-entry and hit the ground at over 100 miles per hour. The Soviets were so secretive about their space program at the time that they even rejected a U.S. offer to send a representative to Komarov's funeral. They told us the ceremony was "private." This was the harsh and curious reality of the early days of space exploration.

Our relationship with our former Soviet competitors has changed fundamentally in the last forty years. I was fortunate enough to be a part of this change—from commanding our ASTP mission to advising on the International Space Station now being built in orbit. In recent years I have learned that the Soviets really did want to beat us to the Moon in the 1960s. In fact, they had several programs designed to upstage Apollo, but their space and missile programs were starved for cash and torn by competition among their leaders. One of the biggest setbacks to their space program was the death of Sergei Korolev in January 1966. Korolev was the leader of OKB-1, the design bureau responsible for virtually all of the Soviet successes in the early space race. Without Korolev's leadership and

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ability to get things done in the Soviet bureaucracy, the brilliant folks who worked on the Russian space program were unable to respond effectively to the Gemini and Apollo programs.

Since the late 1980s, the answers to the questions we had in the 1960s have trickled out in the Russian press, in books, and in frank conversations with the participants. I've heard many stories about the bravery, success, and tragedy that our Russian colleagues faced in their space program. The Russians are great storytellers, and many of the tales about their space program are riveting. But Boris Chertok is one of the greatest storytellers of them all. And what a story he has to tell! Chertok played a part in virtually every major event in the development of the Soviet and Russian space programs. As a former deputy to Korolev at OKB-1, Chertok has an insider's perspective on the space race. He has continued to work for the same organization, now known as Rocket Space Corporation Energia, throughout his long and interesting life. In the memoirs translated here, Chertok tells his stories with compassion, humor, and an unflinching eye for the facts. This is far more than the memoir of an interesting life. Chertok has put the great sweep of twentieth century Russian history, and the role of the space program in that history, into perspective. He has pulled together an incredibly detailed narrative with a unique Russian perspective that is written in a delightfully easy style to read. The translators and editors of this English-language version of Chertok's memoirs have done a fantastic job of capturing the tone and nuance of great Russian storytelling. For anyone who has ever wondered, like me, just what was going on in the Soviet space program, this memoir will provide an invaluable and enjoyable insight.

LT. GEN. THOMAS P. STAFFORD, USAF (RET.)

Gemini VI

Gemini IX

Apollo X

Apollo-Soyuz Test Project

September 2004

Preface to the English Language Edition

IN 2001, I ACCEPTED NASA'S OFFER to translate my four-volume memoir, *Rockets and People*, into English for publication in the United States. By then I had accumulated a large number of critical remarks and requests from the readers of the Russian edition. In addition, after three Russian editions had come out, I myself came to the conclusion that in the new edition I must make additions and changes that make it easier for the American reader to understand the history of Soviet cosmonautics. As a result, this new English-language edition is far from being a word-for-word translation of the Russian edition. I changed the total number of chapters and their arrangement among the volumes (to more strictly adhere to chronology) and took into consideration some of my readers' criticisms as far as the need to add information and make clarifications to make it easier to understand complex events.

As a result of these changes, the description of the flight of Yuriy Gagarin in the English-language version has been moved from volume 2 to volume 3. Correspondingly, part of the material in volume 3 of the Russian edition has been moved to volume 4 in the English version.

Making additions, changes, and revisions to the text proved to be much more difficult for me than doing a rewrite. By the way, this is true not only of printed works. The history of aerospace technology abounds with cases where more effort went into modifying and changing rockets or spacecraft after they had been put into service than on the development of the prototypes.

To begin creating an improved four-volume edition at my age is a risky undertaking. Throughout 2003 and 2004, the texts of the first two volumes of the new edition were handed over to NASA. I still hope to finish working on the new edition of volumes three and four in 2005. Huntsville veteran Jesco von Puttkamer has rendered me great moral support.

Over the course of e-mail correspondence and personal meetings, he has convinced me that the work on "Project Chertok" has been met with enthusiasm in NASA's historical research department.

I express my sincere gratitude to all those at NASA Headquarters who are assisting in the publication of my memoirs.

I am particularly grateful to Asif A. Siddiqi, who has agreed to be my editor. His erudition, command of the Russian language, and profound knowledge of

Rockets and People

the history of Soviet aviation and cosmonautics are a guarantee against possible errors.

Mikhail Turchin has rendered invaluable assistance to “Project Chertok.” He transcribes my manuscript notes into electronic copy, keeps a list of the individuals mentioned in each chapter, scans photographs, and handles the transmission of all the information to NASA. He also edits all the material and gives valuable advice on the structure of the books.

I am sincerely grateful to the veterans of cosmonautics whose valuable comments have provided a very strong stimulus for working on the new edition of my memoirs.

BORIS CHERTOK
Moscow
October 2004

A Few Notes about Transliteration and Translation

THE RUSSIAN LANGUAGE IS WRITTEN using the Cyrillic alphabet, which consists of 33 letters. While some of the sounds that these letters symbolize have equivalents in the English language, many have no equivalent, and two of the letters have no sound of their own, but instead “soften” or “harden” the preceding letter. Because of the lack of direct correlation, a number of systems for transliterating Russian (i.e., rendering words using the Latin alphabet), have been devised, all of them different.

Russian Alphabet	Pronunciation	US Board on Geographic Names	Library of Congress
А, а	ă	a	a
Б, б	b	b	b
В, в	v	v	v
Г, г	g	g	g
Д, д	d	d	d
Е, е	yĕ	ye* / e	e
Ë, ë	yō	yĕ* / ě	ë
Ж, ж	zh	zh	zh
З, з	z	z	z
И, и	ĕ	i	i
Й, й	shortened ĕ	y	ĭ
К, к	k	k	k
Л, л	l	l	l
М, м	m	m	m
Н, н	n	n	n
О, о	o	o	o
П, п	p	p	p
Р, р	r	r	r
С, с	s	s	s
Т, т	t	t	t
У, у	ū	u	u
Ф, ф	f	f	f
Х, х	kh	kh	kh
Ц, ц	ts	ts	ts
Ч, ч	ch	ch	ch
Ш, ш	sh	sh	sh
Щ, щ	shch	shch	shch
ъ	(hard sign)	"	"
ы	guttural ĕ	y	y
ь	(soft sign)	'	'
Э, э	ĕ	e	ĭ
Ю, ю	yū	yu	iu
Я, я	yā	ya	ia

* Initially and after vowels

For this series, Editor Asif Siddiqi selected a modification of the U.S. Board on Geographic Names system, also known as the University of Chicago system, as he felt it better suited for a memoir such as Chertok's, where the intricacies of the Russian language are less important than accessibility to the reader. The modifications are as follows:

- the Russian letters “ь” and “ъ” are not transliterated, in order to make reading easier;
- Russian letter “ё” is denoted by the English “e” (or “ye” initially and after vowels)—hence, the transliteration “Korolev”, though it is pronounced “Korolyōv”.

The reader may find some familiar names to be rendered in an unfamiliar way. This occurs when a name has become known under its phonetic spelling, such as “Yuri” versus the transliterated “Yuriy,” or under a different transliteration system, such as “Baikonur” (LoC) versus “Baykonur” (USBGN).

In translating *Rakety i lyudi*, we on the TTI team strove to find the balance between faithfulness to the original text and clear, idiomatic English. For issues of technical nomenclature, we consulted with Asif Siddiqi to determine the standards for this series. The cultural references, linguistic nuances, and “old sayings” Chertok uses in his memoirs required a different approach from the technical passages. They cannot be translated literally: the favorite saying of Flight Mechanic Nikolay Godovikov (chapter 7) would mean nothing to an English speaker if given as, “There was a ball, there is no ball,” but makes perfect sense when translated as, “Now you see it, now you don't.” The jargon used by aircraft engineers and rocket engine developers in the 1930s and 1940s posed yet another challenge. At times, we had to do linguistic detective work to come up with a translation that conveyed both the idea and the “flavor” of the original. Puns and plays on words are explained in footnotes. *Rakety i lyudi* has been a very interesting project, and we have enjoyed the challenge of bringing Chertok's voice to the English-speaking world.

TTI TRANSLATION TEAM
Houston, TX
October 2004

List of Abbreviations

BAO	Aerodrome Maintenance Battalion
BON	Special Purpose Brigade
ChK or <i>Cheka</i>	Extraordinary Commission for the Struggle with Counter-Revolution and Sabotage
DB-A	Academy Long-Range Bomber
DVL	German Aviation Research Institute
<i>Elektrozavod</i>	Electrical Factory
ESBR	electric bomb release
FON	Special Purpose Faculty
FZU	Factory Educational Institution
GAU	Main Artillery Directorate
GDL	Gas Dynamics Laboratory
GIRD	Group for the Study of Reactive Motion
GKChP	State Committee on the State of Emergency
GKO	State Defense Committee
<i>Glavaviaprom</i>	Main Directorate of the Aviation Industry
<i>Gosplan</i>	State Planning Commission
GTD	gas turbine engine
GTO	Ready for Labor and Defense
GTsP	State Central Firing Range
GULAG	Main Directorate of Corrective Labor Camps
GURVO	Main Directorate of Reactive Armaments
ISS	International Space Station
KB	Design Bureau
KGB	Committee for State Security
KOSTR	Design Department for Construction
LII	Flight-Research Institute
LIS	flight-testing station
MAI	Moscow Aviation Institute
MAP	Ministry of Aviation Industry
MEI	Moscow Power Institute
MEP	Ministry of Electronics Industry

Rockets and People

MGU	Moscow State University
MM	Ministry of Machine Building
MOM	Ministry of General Machine Building
MOP	Ministry of Defense Industry
MPSS	Ministry of Communications Equipment Industry
MRP	Ministry of Radio Industry
MSM	Ministry of Medium Machine Building
MSP	Ministry of Shipbuilding Industry
MVTU	Bauman Moscow Higher Technical Institute
<i>Narkomvoynmor</i>	People's Commissar of Military and Naval Affairs
NEP	New Economic Policy
NII	Scientific-Research Institute
NISO	Scientific Institute for Aircraft Equipment
NII SKA	Scientific-Research Institute for Communications of the Red Army
NII TP	Scientific-Research Institute of Thermal Processes
NKVD	People's Commissariat of Internal Affairs
NPO	Scientific-Production Association
OGPU	United State Political Directorate
OBO	Electrical Equipment Department
ODON	Separate Special Purpose Division
OKB	Experimental-Design Bureau
ORM	Experimental Rocket Motor
OS	final assembly shop
OSO	Special Equipment Department
OTK	Department of Technical Control
PPZh	field camp wives
PUAZO	anti-aircraft fire-control equipment
RD	reactive engine
RD	long-range record
<i>Revvoensovet</i>	Revolutionary Military Council
RKKA	Workers' and Peasants' Red Army (Red Army)
RL	radio communications link
RNII	Reactive Scientific-Research Institute
RSB	air-to-air transceiver station
RSDRP	Russian Social Democratic Workers' Party
SKB	Special Design Bureau
SMERSH	Death to Spies
SON	fire control radars
<i>Spetskom</i>	Special Committee
SPU	aircraft intercom system
SVA	Soviet Military Administration
SVAG	Soviet Military Administration in Germany

List of Abbreviations

TEKhNO	Department of Technological Preparations
TRD	turbojet engine
TsAGI	Central Aero-Hydrodynamics Institute
TsIK	Central Executive Committee
TsKB	Central Design Bureau
TsSKB	Central Specialized Design Bureau
VEI	All-Union Electrical Institute
VKP(b)	All-Union Communist Party (of Bolsheviks)
VPK	Military-Industrial Commission
VRD	jet engine
VTsIK	All-Russian Central Executive Committee
ZhRD	liquid propellant rocket engine
ZIKh	M. V. Khrunichev Factory
ZIS	I. V. Stalin Automobile Factory

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