

Copyrighted Material

Rockets and People

Volume III

*Hot Days
of the
Cold War*



by Boris Chertok

Asif Siddiqi, Series Editor

Copyrighted Material

Rockets and People

Volume III: Hot Days of the Cold War

ISBN 978-0-16-081733-5



For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

ISBN 978-0-16-081733-5

Rockets and People

Volume III: Hot Days of the Cold War

Boris Chertok

Asif Siddiqi, Series Editor

The NASA History Series

National Aeronautics and Space Administration

NASA History Division

Office of External Relations

Washington, DC

May 2009

NASA SP-2009-4110

Library of Congress Cataloging-in-Publication Data

Chertok, B. E. (Boris Evseevich), 1912–
[Rakety i lyudi. English]
Rockets and People: Hot Days of the Cold War (Volume III) / by
Boris E. Chertok ;
[edited by] Asif A. Siddiqi.
p. cm. — (NASA History Series) (NASA SP-2009-4110)
Includes bibliographical references and index.
1. Chertok, B. E. (Boris Evseevich), 1912– 2. Astronautics—
Soviet Union—Biography. 3. Aerospace engineers—Soviet Union—
Biography. 4. Astronautics—Soviet Union—History.
I. Siddiqi, Asif A., 1966– II. Title. III. Series. IV. SP-2009-4110.
TL789.85.C48C4813 2009
629.1'092—dc22

2009020825

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

Contents

	Series Introduction by Asif A. Siddiqi	<i>ix</i>
	Introduction to Volume III	<i>xxi</i>
	A Few Notes about Transliteration and Translation	<i>xxvii</i>
	List of Abbreviations	<i>xxix</i>
1	The Cold War	<i>1</i>
2	Preparation for Piloted Flights	<i>15</i>
3	The First Piloted Spaceflight: “We’re Off”	<i>55</i>
4	The Cuban Missile Crisis . . . and Mars	<i>85</i>
5	Strategic Missile Selection	<i>105</i>
6	Correcting the Great Ones’ Mistakes	<i>159</i>
7	After Gagarin, Others Will Fly	<i>187</i>
8	Man and Woman	<i>217</i>
9	The Voskhods and the First Spacewalk	<i>229</i>
10	Radio Engineering Digression	<i>281</i>
11	Star Wars	<i>303</i>
12	Spying from Space	<i>333</i>
13	The Hard Road to a Soft Landing	<i>373</i>
14	Last Launches Under Korolev	<i>415</i>
15	The Molniya-1 Communications Satellite	<i>453</i>
16	Molniya-1 in Space (and more)	<i>491</i>
17	Korolev’s Last Days, Death, and Funeral	<i>517</i>
18	Birth of the Soyuzes	<i>559</i>
19	Flying the Soyuz	<i>597</i>
20	The Death of Komarov	<i>629</i>
21	“On the Distant Star Venus . . .”	<i>653</i>
22	First Rendezvous and Docking	<i>665</i>
23	Heart-to-Heart Conversation	<i>681</i>
24	Zond-4	<i>697</i>
25	Gagarin’s Birthday and Death	<i>713</i>
26	Academic Digression	<i>731</i>
	Index	<i>755</i>
	NASA History Series	<i>785</i>

Series Introduction

In an extraordinary century, Academician Boris Yevseyevich Chertok has lived an extraordinary life. He has witnessed and participated in many important technological milestones of the 20th 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 60-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 the 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

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

describes how the Soviet design team under the famous Chief Designer Sergey Pavlovich Korolev 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

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.

the Soviet Union's first rocket-powered airplane, the BI. In the immediate aftermath of the war, Chertok, then in his early 30s, 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, 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 30th 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

3. See for example, his article "Chelovek or avtomat?" (Human or Automation?) in the book 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.

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 floodgates 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 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 liudi* (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

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.

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

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.

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 (Volume I, Chapter 21).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,

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.

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 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.

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).

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 Krementsov, *Stalinist Science* (Princeton, NJ: Princeton University Press, 1997).

Soviet space history, like any discipline of history, exists as a continuous process of revision and restatement. Few historians in the 21st 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 dimension to understanding the *mentalité* of the Soviets’ drive to become a modern, industrialized state in the 20th 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 Vasiliy Mishin,

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).

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 Race, 1945–1974*, was an early attempt

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 'Energi'* (Path to Energiya) (Moscow: '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: 'Inform-Znaniye,' 1998); B. I. Gubanov, *Triumf i tragediya 'energi': razmysleniya glavnogo konstruktora* (The Triumph and Tragedy of Energiya: The Reflections of a Chief Designer) (Nizhniy novgorod: NIER, four volumes in 1998–2000); Konstantin Feoktistov, *Trajektoriya zbizni: mezhdru vchera i zavtra* (Life's Trajectory: Between Yesterday and Tomorrow) (Moscow: Vagrius, 2000); N. A. Anifimov, ed., *Tak eto bylo—Memoary 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-kosmicheskiye sily (voynno-istoricheskiy 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, 1960–1963 gg.* (Hidden Space: Book One, 1960–1963) (Moscow: Infotekst 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).

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 (Volume I, Chapter 22). 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.).

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-promyshlennyi kompleks sssr*, pp. 225–226.

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 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 Christoph Mick and those in the United States such as myself have been fortunate to work in Russian archives.²⁵ I would also note the enormous contributions of the Russian monthly journal *Novosti kosmonavтики* (News of Cosmonautics) as well as the Belgian historian Bart Hendrickx in advancing the state of Soviet space history. The new work has opened opportunities for future research. 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 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

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 kosmonavтики: 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 Fernlen-kwaffentechnik in die UdSSR und der Aufbau der sowjetischen Rakettenindustrie 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 sozdaniia kompleksa 'Soyuz'" (On the Creation of the Soyuz Complex), December 4, 1963, RGAE, f. 298, op. 1, d. 3495, ll. 167–292.

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.

The distribution of material spanning the four volumes of Chertok's memoirs is roughly chronological. In the first English volume, Chertok 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, Mars, and Venus.

In the third volume, he begins with the historic flight of Yuriy Gagarin, the first human in space. He 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 largely 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 91 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

27. "Tsentralnyy komitet KPSS i Sovet ministrov SSSR, postanovleniye" (Central Committee KPSS and SSSR Council of Ministers Decree), 3 August 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.

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
October 2004

28. Konovalov, "Ryvok k zvezdam."

Introduction to Volume III

This, the third volume of Boris Chertok's four-volume memoirs, continues the narrative arc which he began in the first volume. If the first volume covered his apprenticeship as an engineer and the second, the birth of the Soviet postwar missile program, in the third volume, we finally have what might be called the full bloom of the Soviet space program. Here, Chertok describes his impressions of the apex of Soviet achievements in space exploration, from the halcyon days of the launch of Yuri Gagarin into orbit in 1961 to the first piloted Soyuz mission in 1967.

Chertok devotes a significant portion of the volume to the early years of Soviet human spaceflight. These include a chapter on the Vostok and Voskhod programs, which left an indelible mark on early years of the "space race," a lengthy meditation on the origins and early missions of the Soyuz program, and a gripping account of one of the most tragic episodes of the Soviet space program: the flight and death of cosmonaut Vladimir Komarov during the very first piloted Soyuz flight in 1967. Additional chapters cover robotic programs such as the Molniya communications satellite system, the Zenit spy satellite program, and the Luna series of probes that culminated in the world's first survivable landing of a probe on the surface of the Moon. Chertok also devotes several chapters to the development of early generations of Soviet intercontinental ballistic missiles (ICBMs) and missile defense systems; his narrative here skillfully combines technical, political, personal, and strategic concerns, highlighting how these considerations were often difficult to separate into neat categories. In particular, we learn about the Soviet drive to develop a workable solid propellant ICBM and the subsequent arguments over the development of second generation ICBMs in the late 1960s, a fight so acrimonious that contemporaries called it "the little civil war."

Chertok's chapter on the Cuban Missile Crisis provides a radically unique perspective on the crisis, from the point of view of those who would have been responsible for unleashing nuclear Armageddon in 1962 had Kennedy and Khrushchev not been able to agree on a stalemate. Two further chapters cover the untimely deaths of the most important luminaries of the era: Sergey

Korolev and Yuriy Gagarin. Each of these chapters is a tour de force, as Chertok uses a vast array of published accounts to enrich his own personal recollections of the episodes. Finally, historians of Soviet science will find much of interest in the concluding chapter focused on the relationship between the space program and the Soviet Academy of Sciences. This chapter represents one of the most insightful descriptions of the formation of a Soviet “aerospace” elite during the post-World War II era.

During the period covered by Chertok, from 1961 to 1967, the Soviet Union achieved an unprecedented series of firsts; Russians still typically associate this era with a “golden age” of Soviet space exploration. Much as the Apollo missions indelibly convey a nostalgic sense of the possibilities of American space exploration, the visages of young “hero” cosmonauts from the early 1960s at parades in Red Square continue to exemplify the immense political and cultural cache of space exploration during the Cold War.

The central figure in Chertok’s tale is Sergey Pavlovich Korolev, the “chief designer” of the leading missile and spacecraft design organization, who many consider the most important architect of the Soviet push for space; he is still eulogized in saintly terms in the post-Soviet landscape. Westerners who have written about the history of the Soviet space program typically fixate on Korolev to the exclusion of other actors. There are compelling reasons to do so: Korolev was an extraordinarily charismatic figure whose biography encompassed equal parts tragedy and redemption. His biographer, Yaroslav Golovanov, astutely noted that, “Korolev was a most exact reflection of an epoch. . . . He knew all its triumphs and drained the cup of its bitterness to the dregs. Korolev’s biography is the concretization of the history of our land in one man . . .”¹ Chertok’s description of Korolev, particularly his last days, gives Westerners an unprecedented perspective into the life of one of the most important scientific managers in the 20th century. Although Korolev is square and central in Chertok’s narrative, the author offers a much more nuanced perspective of the Soviet space program, one that includes a panoply of other characters, from top Communist Party officials who managed the projects, to junior engineers who produced many of the technical innovations. One marvels at his memory—Chertok is able to remember a vast assortment of names of people present at important managerial meetings. Much of this detail is derived from notes made in his contemporaneous diaries from the 1960s and 1970s (the originals of which

1. Yaroslav Golovanov, *Sergei Korolev: The Apprenticeship of a Space Pioneer* (Moscow: Mir Publishers, 1975), 293.

have since been donated for storage to the archives of the National Air and Space Museum in Washington, DC). The chapters in Volume III also highlight his ability to bring to life previously unknown or lesser known individuals in the history of the Soviet space program. For example, in Chapter 15 on the development of the first Soviet communications satellite, Molniya-1, we find touching profiles of brilliant engineers such as 27-year old Vyacheslav Dudnikov, the principal personage behind the design of the satellite, and Murad Kaplanov, the descendent of a royal family of Kumyks, an ethnic minority in the Soviet republic of Dagestan, who designed Molniya's payload. Other more powerful luminaries in the Soviet space program, such as the gifted but irascible Vasilii Mishin who succeeded Sergey Korolev in 1966, are humanized in a manner that contrasts starkly with the wooden depictions of Soviet space personalities so common in Western narratives.

Chertok does not shy away from his obviously high evaluation of scientists and engineers. Like many of his generation, i.e., those that came of age in the 1930s and went on to leading industrial and government positions after World War II, his faith in the power of science and technology to solve the world's problems remains undiminished. In this technocratic view of the ideal human society, Chertok sees a prominent and positive role for scientists and engineers in the functioning of an advanced society. The problems with science and technology are not with those who produce them but rather those, especially politicians and bureaucrats, who use them. It's not surprising that Chertok's account of Minister of Defense Rodion Malinovskiy's visit to Baykonur is scathing; he recalls how the minister had little interest in learning anything about the technology at the launch site, waving away a colonel's report by saying "I don't need you to tell me what's what. You already take me for a complete fool. Instead, why don't you tell me where the latrine is around here." (Chapter 12, p. 353).

The richness of Chertok's writing should not obscure the fact that this is a memoir written by a historical participant, not a tome authored by a professional historian. In other words, the opinions presented here are by definition subjective and thus prone to the same kinds of limitations inherent in any recollection, especially one made over four decades after the events. Partly to correct his own fallibilities, Chertok does an excellent job of using supporting evidence to buttress his impressions. For example, he makes liberal use of recently published material in the Russian press, such as primary documents published in various books or ground-breaking articles by Russian journalists, which have uncovered previously unknown aspects of the Soviet space program. Similarly, since the publication of the first edition in the 1990s, a number of direct participants of space-related events have

- [read online Potsierlijke praktijken in een pakhuis](#)
- [download Driving Blind: Stories](#)
- [download online Economic Growth and the Environment: An Introduction to the Theory book](#)
- [read online Lonely Planet Fiji \(Country Guide\) here](#)

- <http://www.gateaerospaceforum.com/?library/End-Me-a-Tenor--Glee-Club--Book-2-.pdf>
- <http://crackingscience.org/?library/Build-Awesome-Command-Line-Applications-in-Ruby--Control-Your-Computer--Simplify-Your-Life.pdf>
- <http://aneventshop.com/ebooks/The-Real-Mrs--Brown.pdf>
- <http://www.gateaerospaceforum.com/?library/The-Laughing-Policeman--Martin-Beck--Book-4-.pdf>