

The story told in *T-Minus* is true, and the characters you met in the book are real. But roughly 400,000 men and women worked on the Mercury, Gemini, and Apollo programs, and to show them all would have meant putting more than 3,000 people on each page! So C.C. and Max are based on real NASA engineers Caldwell C. Johnson and Max Faget, but in our story they played not only their own parts but also stood in for many engineers and technical people as well. Similarly, Harrison Storms of North American Aviation took on some of the roles and said some of the things that rightfully belonged to other private contractors. Just like in the United States, many thousands of people worked on the Soviet space program, of course. Sergei Korolev was so pivotal to their program, though, that he almost always spoke for himself in the book.

So, here's what we read and consulted to create *T-Minus* — Zander, Kevin, and I hope you liked the book enough to read others about the space race.

### Excellent Overview

Andrew Chaikin, *A Man on the Moon: The Voyages of the Apollo Astronauts* (NY: Penguin, 1994). This book is not presented in alphabetical order like the rest of them because it's special: It is the basis for the HBO Series "From the Earth to the Moon," it's long (but won't feel long), and is as complete a book as you could ever hope for. It's also the best book out there on the subject. Since the book you're holding is only about the race through Apollo 11, I promised myself I would stop once I finished that chapter. But I couldn't help myself, and read it all the way to the end. You won't be able to stop until it's over either.

### More Excellent Overviews

Martha Ackmann, *The Mercury 13* (NY: Random House, 2003). A less scholarly look at the women's space program than Nolan's, but with broader scope.

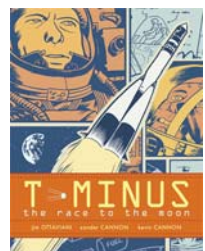
Neil Armstrong, Michael Collins, and Edwin E. Aldrin, Jr. with Gene Farmer and Dora Jane Hamblin, *First on the Moon* (Boston: Little Brown, 1970).

Roger E. Bilstein, *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles* (Washington: NASA, 1980). Part of the NASA History Series, SP-4206 takes you from concept and origin of the Saturn rockets through to their retirement, complete with organizational charts, staff lists, and probably almost 1/100000th of the documentation created during the Saturn's use.

Piers Bizony, *The Man Who Ran the Moon: James E. Webb and the Secret History of Project Apollo* (NY: Thunder's Mouth Press, 2006).

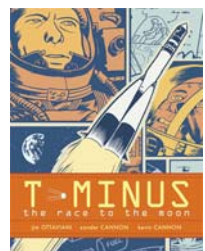
Colin Burgess and Kate Doolan, with Burt Vis, *Fallen Astronauts: Heroes Who Died Reaching for the Moon* (Lincoln: University of Nebraska Press, 2003). Tributes and biographies of astronauts and cosmonauts who died while trying to get to the moon, or into orbit, or sadly, just from one training or inspection mission to another.

*T-Minus* by Jim Ottaviani, Zander Cannon, and Kevin Cannon  
ISBN 978-1416949602  
Aladdin • \$12.99

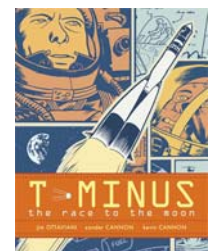


- William E. Burroughs, *This New Ocean: The Story of the First Space Age* (NY: Random House, 1998). A thorough and readable book, the Apollo program only takes up the first half of the book. We're not done with the space age yet!
- Deborah Cadbury, *Space Race: The Epic Battle Between America and the Soviet Union for Dominion of Space* (NY: Harper Collins, 2006). A readable overview of both programs, with many stories that you'll recognize, and many more that we didn't have room to include in our book. Like the Burgess/Doolan and Harvey books, this was a source for details on Komarov's tragic flight.
- Henry S. Cooper, "Annals of Space: We Don't Have to Prove Ourselves," *New Yorker*, September 2, 1991, 41-69. A career retrospective on Max and C.C. that has the dual benefits of being both enjoyable and introducing me to Ivy Hooks.
- Discover Presents *The History of Space Travel*, Fall, 2007. Full of wonderful illustrations and anecdotes about the past and future of human (and robotic) voyages into space.
- Oriana Fallaci, *If the Sun Dies* (NY: Atheneum, 1967; translated from the Italian by Pamela Swinglehurst). The style of the book, presented as a long letter to Fallaci's father, is precious, but the emotional depth and the love and respect Fallaci had for the astronauts is apparent throughout.
- Francis French and Colin Burgess, *In the Shadow of the Moon: A Challenging Journey to Tranquility, 1965-1969* (Lincoln, NE: University of Nebraska Press, 2007). Detailed look at the somewhat forgotten, but still dramatic and definitely crucial Gemini missions.
- Robert Godwin (ed.), *Rocket and Space Corporation Energia: The Legacy of S.P. Korolev* (Burlington, Ontario: Apogee Books, 2001). This translation of a company public relations book has tremendous photographs of all phases of the Russian (and previously, Soviet) space program, and lots of them. Their many firsts are on display, as is their long history of innovation. In an era of the International Space Station, it's easy to forget that while NASA spent a couple of decades drawing pictures of it, the Soviets were up there, in MIR, the whole time.
- Michael Gorn, *NASA: The Complete Illustrated History* (London: Merrell, 2005). This book has hundreds of beautiful photographs from both Earth and space.
- Mike Gray, *Angle of Attack: Harrison Storms and the Race to the Moon* (NY: W.W. Norton, 1992). The only book on Stormy that I know of. It reads like a mystery, even though you already know how it's going to end.
- James R. Hansen, *First Man: The Life of Neil A. Armstrong* (NY: Simon and Schuster, 2005). The most detailed account of Neil Armstrong's life and career that a researcher could hope for, and given Armstrong's private nature, the most detailed account we're likely to get.

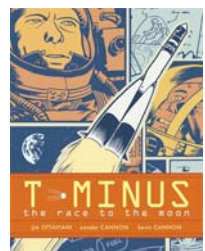
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- James Hartford, *Korolev: How One Man Masterminded the Soviet Drive to Beat America to the Moon* (NY: John Wiley & Sons, Inc., 1997). There's a longer biography of Korolev out there, but it's written in Russian, so I couldn't read it. Korolev lived a hard life, and if he hadn't died prematurely the space race might have been a photo-finish, and then shifted immediately to one focused on a Mars landing.
- Brian Harvey, *The New Russian Space Programme: From Competition to Collaboration* (NY: Wiley, 1996). This book covers the broad history of the Soviet program.
- Heeresversuchsstelle Peenemünde, *A 4 [Vier]-Fibel* (Peenemünde, Germany: 1944). Restricted to field soldiers, the Fibel was a technical manual for the V-2 missile, intended as an operator's guide to bridge the gap between technical laboratory reports and the soldier who used the equipment. It is illustrated throughout with cartoon drawings.
- Harry Hurt III, *For All Mankind* (NY: Atlantic Monthly Press, 1988). Includes source material from many astronauts by Al Reinert, who did the acclaimed movie of the same name.
- Bettyann Holtzmann Kevles, *Almost Heaven: The Story of Women in Space* (Cambridge, MA: The MIT Press, 2006).
- W. Henry Lambricht, *Powering Apollo: James E. Webb of NASA* (Baltimore: Johns Hopkins University Press, 1995).
- Roger D. Launius and J.D. Hunley, *An Annotated Bibliography of the Apollo Program* (Washington: NASA History Office, July, 1994; Monographs in Aerospace History #2). If all this isn't enough to read, you can learn about even more books to seek out from this 25th anniversary list.
- Alan Lawrie, with Robert Godwin, *Saturn* (Burlington, Ontario: Apogee Books, 2005). Complete specifications on the Saturn, how it was built, and how it flew. Speaking of flying, this includes a CD of rare Saturn test and flight footage.
- Richard S. Lewis, *The Voyages of Apollo: The Exploration of the Moon* (NY: New York Times Books, 1974).
- Gene J. Matranga, C. Wayne Ottinger, and Calvin R. Jarvis with D. Christian Gelzer, *Unconventional, Contrary, and Ugly: The Lunar Landing Research Vehicle* (Washington: NASA History Office; Monographs in Aerospace History #35, SP-2004-4535). LLRV No. 1, and its cousins, were a tough ride. No. 1 almost killed Neil Armstrong, but none of the Apollo Commanders or Lunar Module Pilots were willing to forgo training on it. The Soviet cosmonauts did even riskier training. They simply flew helicopters up and then cut the engines.
- James McGovern, *Crossbow and Overcast* (NY: William Morrow, 1964). The operations to capture von Braun and the V2 rocket.



- Charles Murray and Catherine Bly Cox, *Apollo: The Race to the Moon* (NY: Simon and Schuster, 1989). This book gives the most complete and readable account of the science and engineering that went into building the first spacecraft. If these stories won't get you interested in studying math, or taking apart your bicycle to see how it works, nothing will.
- Stephanie Nolan, *Promised the Moon: The Untold Story of the First Women in the Space Race* (NY: Four Walls Eight Windows, 2002).
- Richard W. Orloff and David M. Harland, *Apollo: The Definitive Sourcebook* (Chichester, UK: Praxis Publishing, 2006). Very complete, with detailed information on mission timelines, biographical sketches, scientific results, and many photographs.
- Robert C. Seamans, Jr., *Project Apollo: The Tough Decisions* (Washington: NASA History Office; SP-2005-4527, Monographs in Aerospace History #37).
- Asif A. Siddiqi, *Sputnik and the Soviet Space Race* and *The Soviet Space Race with Apollo* (Gainesville, FL: University of Florida Press, 2003). Originally published by NASA as *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*, this is the comprehensive overview of what the Soviets were up to on the other side of the world. They were up to a lot.
- Andrew Smith, *Moon Dust: In Search of the Men Who Fell to Earth* (NY: Fourth Estate, 2005). If you want to know what it was like to grow up during the space race, and want to find out what the moonwalkers are doing now, this book will tell you. It's clear Smith had a great time writing it as well!
- Scott P. Sullivan, *Virtual Apollo* (Burlington, Ontario: Apogee Books, 2002). 3-D renderings of the CSM interiors and exteriors, based on the engineering drawings used to build the spacecraft.
- Scott P. Sullivan, *Virtual LM* (Burlington, Ontario: Apogee Books, 2004). Includes a CD with Apollo operations handbooks, cue cards, data cards, photographs of mission simulators, and more. You could build your own — if you had a lot of time and money, or 10s of thousands of skilled friends.
- Jules Verne, *From the Earth to the Moon* (1865). A spaceship named Columbiad, a four day trip out, a three man crew, launching from Florida...Verne got a lot of things right!
- Margaret A. Weitekamp, *Right Stuff, Wrong Sex: America's First Women in Space Program* (Baltimore: The Johns Hopkins University Press, 2004). Did you ever wonder why there were no women astronauts in the Apollo program, even though we have C.C. comment on how effective they might be? Here's why, and how close 13 women came. There's another whole book — many, in fact — you could do on women in space, starting with the Mercury 13 and how politics prevented that promising avenue from opening sooner. Jerrie Cobb, Jane B. Hart, Wally Funk, and many others were ready to go.



### First Person Accounts

Buzz Aldrin (personal phone conversation, 10 August 2007). Dr. Aldrin was generous with his time and expertise, and discussed rendezvous and the landing computer they relied on to put the LM down in the Sea of Tranquility.

Neil Armstrong (personal communication, 31 July 2007). Mr. Armstrong very graciously shared his thoughts on Apollo technology and computers with me.

Alan Bean (personal phone conversation, 8 January 2008). Mr. Bean shared information on his role in relaying the news about the Apollo 1 fire. There was no duty officer in the Astronaut Office, so he simply happened to be there when the call came in. He immediately got in touch with Deke Slayton and Alan Shepard, and though he can't remember for sure, he thought it possible that he was the one who made the call out to California to stop that test next.

M. Scott Carpenter, L. Gordon Cooper, Jr., John H. Glenn, Jr., Virgil I. Grissom, Walter M. Schirra, Jr., Alan B. Shepard, Jr., and Donald K. Slayton, *We Seven* (NY: Simon and Schuster, 1962).

Eugene Cernan and Don Davis, *The Last Man on the Moon* (NY: St. Martins, 1999). Cernan rode on Apollo 10 and Apollo 17, and was on the pad testing a version of the Apollo 1 spacecraft when the fire that killed Grissom, Chaffee, and White. His description of the Saturn V stack (p. 186) is my favorite of the accounts I've read.

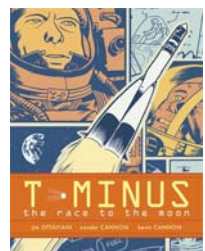
Jerrie Cobb, *Woman Into Space: The Jerrie Cobb Story* (NY: Prentice-Hall, 1963). The most famous and active of the Mercury 13 has led a remarkable life, including flying numerous humanitarian missions into the Amazon. You can read more about that work in her book *Solo Pilot*.

Michael Collins, *Carrying the Fire: An Astronaut's Journey* (NY: Cooper Square Press, 2001). My favorite book by an astronaut — other's come close, but this is the best.

Max Faget Oral History (18-19 June 1997 and 19 August 1998, available at [http://www.jsc.nasa.gov/history/oral\\_histories/oral\\_histories.htm](http://www.jsc.nasa.gov/history/oral_histories/oral_histories.htm)). As with all of the oral histories, there are plenty of great anecdotes in these transcripts. You can hear the plain talk.

John Glenn, with Nick Taylor, *John Glenn: A Memoir* (NY: Bantam, 1999). Astronaut Glenn says he was suspicious of the order to leave the retrorockets strapped to hold the heat shield in place. He later told Mission Control folks "Don't ever leave a guy up there again without giving him all the information you have available. Otherwise, what's the point of having a manned program?"

Dr. Robert H. Goddard, *Rockets, comprising "A Method of Reaching Extreme Altitudes" and "Liquid-Propellant Rocket Development"* (NY: American Rocket Society, 1946).





Ivy Hooks Interview, conducted by Lauren Kata (available online via the Society of Women Engineers at <http://archives.swe.org/swewomen/profiles/hooks.aspx>). One of the first women to crack NASA's inner circle of engineers. She had a remarkable and influential career.

Caldwell C. Johnson, Jr. Oral History and Biographical Data Sheet (1 April 1998, 12 May 1998, and 27 April 1999, available at [http://www.jsc.nasa.gov/history/oral\\_histories/oral\\_histories.htm](http://www.jsc.nasa.gov/history/oral_histories/oral_histories.htm)). There's not a lot of detail available about C.C., but reading these interviews will give you a feel for a man who Got Things Done.

Caldwell C. Johnson Papers (Accession # 2000-0019 in Building 12 of NASA's Garber Facility, Suitland, MD) Handling C.C.'s original sketches for Apollo set my fingers on fire. Literally, they tingled. Apparently he still has his original drawing for Mercury framed and in his house. Which is where it belongs, until it goes into a museum! They are works of art and engineering at the same time — truly rare birds.

Thomas Kelly, *Moon Lander: How We Developed the Apollo Lunar Module* (Washington: Smithsonian Institution Press, 2001). The title says it all. I got particularly intrigued by the battle to keep the weight down, and the resulting paper-thin walls of the LM. The Apollo astronauts were a long way from home to be protected by something you could poke a pencil through.

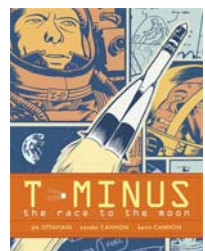
Chris Kraft, *Flight: My Life in Mission Control* (NY: Dutton, 2001). Straight talking from the guy who basically invented Mission Control. His squabbles with astronauts and politicians will make the space program feel like a truly human endeavor to you.

Gene Kranz, *Failure is Not an Option: Mission Control from Mercury to Apollo 13 and Beyond* (NY: Simon & Schuster, 2000). If you've ever seen the movie *Apollo 13* (and if you haven't, what are you waiting for?!) you'll picture Ed Harris playing Gene Kranz. And once you've seen a picture of Gene Kranz and read his book, you'll believe the portrayal even more.

W. Randolph (Randy) Lovelace, "Duckings, Probings Checks that Proved Fliers' Fitness," *Life*, vol. 46, no. 16, April 20, 1959, 22-29. Dr. Lovelace's light-hearted account of the tests he devised for and performed on the prospective Mercury astronauts. It includes a speaking test that supposedly included all the sounds in the English language. Apparently you can't have everything without saying "Banana Oil!"

W. Randolph Lovelace II. M.D., M.S., A.H. Schwichtenberg, M.D., Ulrich C. Luft, M.D. and Robert R. Secrest, M.D., "Selection and Maintenance Program for Astronauts for the National Aeronautics and Space Administration," *Aerospace Medicine*, vol. 33, June 1962, 667-684. More detailed than the story above, this gives the full story behind the tests that the Mercury 7 and later the Mercury 13 passed. If you want to pass, remember not to re-apply oil, spray, or anything on hair until after your electroencephalogram.

Owen Maynard Oral History (21 April 1999, available at [http://www.jsc.nasa.gov/history/oral\\_histories/oral\\_histories.htm](http://www.jsc.nasa.gov/history/oral_histories/oral_histories.htm)). One of C.C.'s co-workers and, I'd like to imagine, friends at NASA, he came from Canada's famed AVRO project. The ill-fated AVRO Arrow was a well ahead of its time, but when the contract for it got cancelled by NORAD, Canada's loss became NASA's gain as many of their best engineers came to the U.S. to help make the moon landing possible.



Dave Scott and Alexei Leonov, with Christine Toomey, *Two Sides of the Moon* (NY: St. Martin's Press, 2004). Leonov's first person account of his spacewalk and what happened afterwards is the best part of this book...at least for me. He and Dave Scott tell so many great stories, though, that you may find a different favorite.

Bernice Trimble Steadman with Jody M. Clark, *Tethered Mercury, A Pilot's Memoir: The Right Stuff...But the Wrong Sex* (Traverse City, MI: Aviation Press, 2001). One of the Mercury 13 tells her story — it's much richer than a missed chance at astronaut training!

*In the Shadow of the Moon* directed by David Singleton and featuring astronauts Buzz Aldrin, Alan Bean, Eugene Cernan, Michael Collins, Charlie Duke, Jim Lovell, Edgar D. Mitchell, Harrison Schmitt, Dave Scott, and John Young (THINKFilm, 2007). Rare footage and candid discussions of what it was like to train on, fly in, and land the Apollo spacecraft. Very cool.

Spacecraft Films, *Apollo 8: Leaving the Cradle, Apollo 10: The Dress Rehearsal, Apollo 11: Men on the Moon*, and *Mission to the Moon*. These DVDs compile NASA films and other video to give you a sense of what it was really like to be on a trip to the moon. If you're expecting IMAX, you'll be disappointed, but remember that there was no such thing as IMAX in the 1960s. There were no HDTVs or cell phones, internet, or PCs either. In fact, *Mission to the Moon* will show you how they made computer back then, when it was all very new. Amazing! Spacecraft Films has produced cool DVDs on the Mercury and Gemini programs as well.

Glen E. Swanson (ed.), *"Before This Decade Is Out...": Personal Reflections on the Apollo Program* (Washington: NASA, 1999). Part of the NASA History Series, SP-4223 presents memoirs and oral histories from famous and not-as-famous key NASA people ranging from James E. Webb to Wernher von Braun to Charlie Duke to Max Faget.

Guenter Wendt and Russell Still, *The Unbroken Chain* (Burlington, Ontario: Apogee Books, 2001). Personal anecdotes related by the last person astronauts saw before they blasted off. The practical jokes ("gotchas") are fun to read about. The one specific incident we used for the book was the Mercury 7 watching their first Atlas launch in May, 1959, where after the rocket explodes Shepard turns to Glenn and deadpans out the side of his mouth "I sure hope they fix that."

## Web Resources

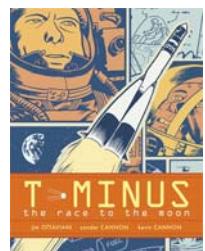
Chariots for Apollo: A History of Manned Lunar Spacecraft, by Courtney G. Brooks. James M. Grimwood and Loyd S. Swenson, Jr. <<http://www.hq.nasa.gov/office/pao/History/SP-4205/cover.html>>. This is tremendously good and valuable.

"Dogs in Space" <<http://www.enchantedlearning.com/subjects/astronomy/dogs/>>. I didn't use this site, but I like it.

Encyclopedia Astronautica <<http://www.astronautix.com/flights/>>. An excellent resource for detailed flight information throughout the space race.

Key Documents in the History of Space Policy <<http://history.nasa.gov/spdocs.html#1960s>>. For the political scientist in you!

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Mission Transcripts for the Mercury, Gemini, and Apollo missions are available at the Johnson Space Center's site. Specifically, you can find the ones we used at  
<[http://www.jsc.nasa.gov/history/mission\\_trans/mercury.htm](http://www.jsc.nasa.gov/history/mission_trans/mercury.htm)>  
<[http://www.jsc.nasa.gov/history/mission\\_trans/gemini5.htm](http://www.jsc.nasa.gov/history/mission_trans/gemini5.htm)>  
<[http://www.jsc.nasa.gov/history/mission\\_trans/apollo8.htm](http://www.jsc.nasa.gov/history/mission_trans/apollo8.htm)>  
<[http://www.jsc.nasa.gov/history/mission\\_trans/apollo10.htm](http://www.jsc.nasa.gov/history/mission_trans/apollo10.htm)>  
<[http://www.jsc.nasa.gov/history/mission\\_trans/apollo11.htm](http://www.jsc.nasa.gov/history/mission_trans/apollo11.htm)>

MIT - Apollo Guidance Computer <<http://ed-thelen.org/comp-hist/vs-mit-apollo-guidance.html>>, with cool links to other sites, including a simulation of the computer at <<http://www.ibiblio.org/apollo/index.html>>.

This New Ocean: A History of Project Mercury <<http://history.nasa.gov/SP-4201/toc.htm>>.

NASA's History Division has created a site "Apollo Lunar Surface Journal" and "Apollo Flight Journal" <<http://history.nasa.gov/alsj/>> which give detailed accounts of what the astronauts saw and did on their way to and from the Moon, and while they walked and drove around on it. It's a work in progress, but the text, videos, and pictures that are there already are tremendous. The NASA Library also has many great publications available on all aspects of the space program, and the folks there were very helpful as well.

NASA Acronyms <<http://spaceflight.nasa.gov/cgi-bin/acronyms.cgi>>

R-7 Family of Launchers <<http://www.russianspaceweb.com/r7.html>>. All of Russian Space Web is worth digging around in, of course!

Sounds from the First Satellites <<http://www.amsat.org/amsat-new/satellites/sounds/index.php>>. Now sounds from satellites include just about every radio and TV program you can imagine, along with GPS signals and more. But 50 years ago all you got were "deet"s.

Vostok 1 - An Analysis <<http://www.svengrahn.pp.se/histind/Vostok1/Vostok1X.htm>>. You can hear Yuri Gagarin's excitement via audio clips.

### Other fun things to read

If you want to read more comics about the space race, you can find out about the first dog in space, and Korolev as well, from Nick Abadzis' book *Laika* (NY: First Second, 2007). What about the chimps, you ask? You'll meet Ham, the first chimpanzee to fly in space, in Jim Vining's book *First in Space* (Portland, OR: Oni Press, 2007). Both are first rate in terms of both story and art.

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