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Introduction

1. For example, Roger D. Launius, “Heroes in a Vacuum: The Apollo Astronaut as Cultural Icon” (paper presented at the 43rd AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, January 10–13, 2005).
5. While labor historians employ the word “autonomy” to describe workers’ degree of control over their labors, the word, as used by NASA in internal memoranda, generally referred to the ability of a crew to operate in orbit independently of ground controllers. Even these activities, though, would normally follow a well-planned sequence of prescribed steps. See, for example, “Crew Autonomy,” November 21, 1978, Box 1, Thomas K. Mattingly Files, Center Series, Johnson Space Center History Collection, University of Houston–Clear Lake.


20. Larson, 149.

1 “Project Astronaut”


2. See, for example, Craig Ryan, *The Pre-Astronauts: Manned Ballooning on the Threshold of Space* (Annapolis: Naval Institute Press, 1995).


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Center, 1959), 1; Mac Mills Link, “Stress Testing,” in Space Medicine in Project Mercury (Washington, DC: NASA, 1965). Aviation medicine specialists had been discussing the topic informally since the end of World War II, when a group of air force physiologists augmented their numbers with leading German researchers (including Hubertus Strughold, called the “father of space medicine”), invited to the United States after the War.


17. “The astronaut selection program within NASA was handicapped at the beginning by the problem of trying to define ‘what is an astronaut’ and ‘what are his duties.’ ” Stanley C. White, M.D., “Review of Astronaut Selection,” June 17, 1963, Flight Crew Operations Directorate, Center Series, Box 3, Johnson Space Center History Collection, University of Houston–Clear Lake.


26. Ibid.


28. Low, “Memorandum to T. Keith Glennan Re: Pilot Selection for Project Mercury.”


34. Ibid.
36. Swenson, Grimwood, and Alexander, This New Ocean, a History of Project Mercury, 26.
40. Frank Van Riper, Glenn, the Astronaut Who Would Be President (New York: Empire Books, 1983), 126.
41. John Catchpole, Project Mercury: NASA’s First Manned Space Programme (Chichester: Praxis, 2001), 160.
42. Van Riper, Glenn, the Astronaut Who Would Be President, 125.
45. French and Burgess, Into That Silent Sea, 205.
49. Colin Burgess, Selecting the Mercury Seven: The Search for America’s First Astronauts (Chichester: Springer-Praxis, 2011), 38.
51. French and Burgess, Into That Silent Sea, 135, 204.
52. Atkinson and Shafritz, The Real Stuff, 42.
53. French and Burgess, Into That Silent Sea, 204–05.
57. David Sington, “In the Shadow of the Moon” (Discovery Films, 2007); Collins, Carrying the Fire.
58. See, generally, Burgess, Selecting the Mercury Seven.
59. Sington, “In the Shadow of the Moon.”
63. Santy, Choosing the Right Stuff, 17.
65. See, generally, Burgess, Selecting the Mercury Seven.
71. Wilson, Program Project Mercury Candidate Evaluation Program, 89; Atkinson and Shafritz, The Real Stuff, 43; Mackowski, Testing the Limits, 193.
72. Wilson, Program Project Mercury Candidate Evaluation Program, 89.
74. Wilson, Program Project Mercury Candidate Evaluation Program, 89.
76. Atkinson and Shafritz, The Real Stuff, 45.
77. Wilson, Program Project Mercury Candidate Evaluation Program.
82. Santy, Choosing the Right Stuff, 16.
84. Ruff and Levy, “Psychiatric Evaluation of Candidates for Space Flight,” 389. The notion that astronauts are incapable of anxiety persists in popular culture despite the lack of any empirical support for the claim. In one 2009 article, the author described how a noted professor of psychology was certain that “when the United States sends people up in space, the steely, brave astronauts were low-reactive as infants, and the mission-control people down on the ground, doing the detail work that keeps the craft aloft,
were high-reactive.” Robin Marantz Henig, “Understanding the Anxious Mind,” *New York Times Magazine*, October 4, 2009, 64. In fact, astronauts fretted constantly about their performance, and were often the most detail-obsessed members of NASA ground teams.


87. Burgess, *Selecting the Mercury Seven*, 220.


91. Santy, *Choosing the Right Stuff*, 17.


94. Burgess, *Selecting the Mercury Seven*, 257.


97. Ibid., 390.


105. Korchin and Ruff, “Personality Characteristics of the Mercury Astronauts,” 201. Indeed, the mainstream Christian homogeneity of the early astronauts has been a standing joke in the space program; at the end of Woody Allen’s 1971 film *Bananas*, a faux news bulletin flashes across the lower screen announcing that Apollo astronauts have opened “the first all-Protestant cafeteria on the Moon.” Woody Allen, “*Bananas*” (United Artists, 1971).


NOTES

111. Ibid., 4–5.
114. Ibid., 15–21.
119. While a “farm boy” mythology would eventually emerge around the men in popular culture, this characterization, likely motivated by Wolfe’s descriptions of Chuck Yeager in *The Right Stuff*, was not based in fact.
138. For example, Slayton and Cassutt, *Deke!*
139. Society of Experimental Test Pilots., History of the First 20 Years, 62; De Groot, Dark Side of the Moon, 112.


142. Catchpole, Project Mercury, 160.


146. Carpenter, We Seven, 97–98.

147. Ibid., 90, 101.

148. Ibid., 91.

149. Schefter, The Race, 88.

150. Schefter, The Race, 88.

151. Carpenter, We Seven, 108.

152. Carpenter, We Seven, 97–98.

153. French and Burgess, Into That Silent Sea, 80.


155. Slayton and Cassutt, Deke!, 67.


157. Collins, Carrying the Fire, 37.


159. Collins, Carrying the Fire, 37.


162. French and Burgess, Into That Silent Sea, 257.


169. Ibid.
172. For example, Siddiqi, *Challenge to Apollo*, 271–283; See, for example, Jamie Doran, *Starman: The Truth Behind the Legend of Yuri Gagarin* (London: Bloomsbury, 1998), 82.
174. Carpenter, *We Seven*, 220.
176. Indeed, as Apollo 8 astronaut William Anders later noted, “as fighter pilots, it’s much better to die than screw up.” Borman, Lovell, and Anders, “John H. Glenn Lecture: An Evening with the Apollo 8 Astronauts.”
180. Schirra, “History Transcript (Roy Neal, Interviewer),” 5.
182. Schirra and Billings, *Schirra’s Space*, 77.
183. Muson, “Comedown from the Moon,” 136–137. Shepard never acknowledged a subordinate role to Slayton, and the two often acted in concert, especially in assigning crews to flights.

2 “Deke’s Boys”

2. Ibid., 14.
6. “The problem of selection encountered during the second cycle was considerably different and, in the main much easier.” Staley C. White, M.D.,
“Review of Astronaut Selection,” June 17, 1963, Flight Crew Operations Directorate, Center Series, Box 3, Johnson Space Center History Collection, University of Houston–Clear Lake.


15. For example, “Use Of Astronauts In Quality Assurance Visits,” March 3, 1964, Box 064–24, Apollo Series, Johnson Space Center History Collection, University of Houston–Clear Lake; Mindell, *Digital Apollo*, 155.


20. George M. Low, “Handwritten Annotation Upon Memorandum from John P. Donnelly to George M. Low,” November 20, 1972, Folder 1, Box 50, George M. Low Papers, Archives and Special Collections, Rensselaer Polytechnic Institute, Troy, New York.


29. The contracts’ benefits, though, were nearly outweighed by the criticism they generated from NASA managers, governmental officials, the public,
and the press, for whom the agreement represented a form of “crass commercialism” that cheapened the space program. Walter L. Lingle Jr., “Memorandum for the Deputy Administrator Re: Ad Hoc Committee on Astronauts; Life Contract,” July 26, 1962, Folder 008937, NASA Historical Reference Collection, NASA Headquarters, Washington, DC. Editors of competing publications were particularly furious, concerned by the blurry boundary between public and private aspects of the astronauts’ stories and afraid that NASA had effectively granted a few publications exclusive rights to major public figures. Sherrod, “The Selling of the Astronauts,” 18. Among those “cut out of the picture,” in fact, was the federal government’s own United States Information Agency, which found its efforts to interview the astronauts blocked by the life contract. William E. Howard, “USIA Editors Scooped on Flight Stories,” The Birmingham News, May 29, 1963, 16.


32. French and Burgess, In the Shadow of the Moon, xii.


40. French and Burgess, In the Shadow of the Moon, xi.


47. Wolfe, The Right Stuff, 27–28, 329. While NASA prohibited pilots from flying jets less than 12 hours after consuming alcohol (the so-called “bottle-to-throttle” rule), excessive off-duty drinking at Cape Kennedy often extended well into the morning of space launches, for which no such rule applied. In 2007, NASA released unsubstantiated reports that two astronauts may have actually flown in space while so intoxicated that their performance


49. French and Burgess, In the Shadow of the Moon, 198.


55. Shayler, NASA’s Scientist-Astronauts, 83–85.


57. French and Burgess, In the Shadow of the Moon, 186, 204, 206–208, 219, 233, 235–236 [quoting authors’ interviews of Schirra and Cunningham].


59. Ibid., 216–217.

60. Ibid., 212.

61. Ibid., 98–99, 189.

62. Shayler, NASA’s Scientist-Astronauts, 247.


64. Joseph A. Califano Jr., “Memorandum to Secretary of Defense; Administrator, National Aeronautics and Space Administration,” August 17, 1965, Folder 008949, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.


69. Shayler, NASA’s Scientist-Astronauts, 244.


72. Collins, Carrying the Fire, 313.
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75. David J. Shayler, Skylab: America’s Space Station (Chichester, UK: Praxis, 2001), 123. This question often arises in connection with the crew selected for the first attempted lunar landing, Apollo 11—Neil Armstrong, Buzz Aldrin, and Michael Collins. Slayton has insisted that any of NASA’s astronauts could have successfully flown that mission and that it was merely the crew’s turn in the rotation. Apollo 11’s crew, though, was composed entirely of veteran astronauts—a rarity—known for their unique skills and abilities.


77. Cernan and Davis, The Last Man on the Moon, 67.


80. Hansen, First Man, 231.

81. Slayton and Cassutt, Deke!, 136.

82. Ibid.


84. French and Burgess, In the Shadow of the Moon, 185 (quoting Cunningham).

85. Shayler, Skylab, 105.


87. Slayton and Cassutt, Deke!, 145.

88. Ibid., 143.


90. Slayton and Cassutt, Deke!, 134; French and Burgess, In the Shadow of the Moon, 196.

91. Cunningham, The All-American Boys (Revised Edition), 48; Slayton and Cassutt, Deke!, 134.

92. French and Burgess, In the Shadow of the Moon, 293.

93. Ibid.; Shayler, Skylab, 304–305.


95. Shayler, Skylab, 305; French and Burgess, In the Shadow of the Moon, 185.


97. French and Burgess, In the Shadow of the Moon, 64.


99. Thomas P. Stafford and Michael Cassutt, We Have Capture: Tom Stafford and the Space Race (Washington, DC: Smithsonian Institution Press, 2002),
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142–144; Shayler, Skylab, 122; Cernan and Davis, The Last Man on the Moon, 238; Slayton and Cassutt, Deke!, 237.

100. Cernan and Davis, The Last Man on the Moon, 263.
102. Ibid., 243; French and Burgess, In the Shadow of the Moon, 361; Shayler, Skylab, 118–120.
103. Slayton and Cassutt, Deke!; Stafford and Cassutt, We Have Capture.
104. French and Burgess, In the Shadow of the Moon, 319.
106. French and Burgess, In the Shadow of the Moon, 123, 125, 126.
109. Ibid., 5, 15.
110. Cunningham, The All-American Boys (Revised Edition), 47.
111. Ibid., 134.
113. Ibid., 10.
115. Mindell, Digital Apollo, 208.
118. Mindell, Digital Apollo, 63.
119. French and Burgess, In the Shadow of the Moon, 70.
120. Collins, Carrying the Fire, 197–198.
122. Ibid., 24.53.
129. Collins, Carrying the Fire, 215.
131. Ibid., 304.
135. French and Burgess, In the Shadow of the Moon, 214.
136. Ibid., 69.
137. Ibid., 76.
150. Mindell, *Digital Apollo*, 105.
151. Ibid., 165.
152. Ibid., ch. 4.
154. Mindell, *Digital Apollo*, 86.
156. Ibid., 72.
157. Ibid., 213.
165. Ibid., 528–529.
167. Ibid., 32–33.
170. Ibid., 48–49.
173. Ruff and Korchin, “Psychological Responses of the Mercury Astronauts to Stress,” 218. While few astronauts ever admitted to being afraid while in orbit, space vehicles presented so many different potential failure modes that Michael Collins, one of the more openly self-reflective of the astronauts, later admitted to being “mildly worried all the time” during his Apollo 11 flight. Sington, “In the Shadow of the Moon.” Motion picture (Discovery Films, 2007).
175. Mailer, Of a Fire on the Moon, 334.
179. Ibid., 218.
182. Ibid., 86–87.
183. Sington, “In the Shadow of the Moon.”
184. McCurdy, Space and the American Imagination, 84.
185. Ibid., 92.
188. Collins, Carrying the Fire, 215.
189. French and Burgess, In the Shadow of the Moon, 315–316; Mindell, Digital Apollo, 179.
191. Grissom had failed to seal the oxygen inlet on his suit before disembarking, causing it to fill with seawater and nearly drowning him. Fortunately, the neck of Grissom’s suit was sealed against water penetration by a rubber barrier Schirra had recently added to the suit; an innovation credited with saving Grissom’s life. Even worse, during the investigation, Grissom admitted to needlessly weighing himself down with coins, dollar bills, and other souvenirs, and noted that immediately before the hatch explosion he had contemplated retrieving his survival knife as a keepsake. Even so, when a helicopter dropped a padded rescue strap to pull him out of the water, Grissom, exhausted, climbed into it backwards. The capsule, filled with too much water to be lifted by helicopter, sank rapidly. Grissom, once safely ensconced in the helicopter, grabbed a life preserver and spent his short flight to an awaiting aircraft carrier fastening it, apparently startled by the incident. French and Burgess, Into That Silent Sea, 84–88.
192. French and Burgess, In the Shadow of the Moon, 1–2, 4.
195. Ibid., 158–159.
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204. French and Burgess, *In the Shadow of the Moon*, 50.
205. Astronauts may be analogizes to other groups of workers whose ethnic or religious differences interfered with efforts to organize and bargain collectively in the workplace. See, for example, Bruce Nelson, *Divided We Stand: American Workers and the Struggle for Black Equality, Politics and Society in Twentieth-Century America* (Princeton: Princeton University Press, 2001).

3 Scientists in Space

4. Occasionally joining the “real” crew were the professor’s comely female assistant, a monkey, a child, or an imbecile, to provide comic relief, dramatic tension, a romantic partner for the ship’s pilot, or a surrogate for the audience to whom plot points could be explained. Byron Haskin, “Robinson Crusoe on Mars” (Paramount Pictures Corp., 1964); Kurt Neumann, “Rocketship X-M” (Lippert Pictures, 1950).
11. See, for example, Walter A. McDougall, The Heavens and the Earth, (Baltimore: Johns Hopkins University Press, 1997).
17. Ibid., 61–66.
18. O’Leary, “Topics: Science or Stunts on the Moon?”
19. Atkinson and Shafritz, The Real Stuff, 64.
27. Slayton and Cassutt, Deke!, 143.
29. Ibid.
30. Shayler, NASA’s Scientist-Astronauts, 30.
32. David Sington, “In the Shadow of the Moon” (Discovery Films, 2007).
34. Slayton and Cassutt, Deke!, 143.
37. Atkinson and Shafritz, The Real Stuff, 73.
44. Shayler, *NASA’s Scientist-Astronauts*, 56.
49. Ibid., 28.
62. Ibid., 112.
63. Ibid., 285.
75. Ibid.
76. Shayler, NASA’s Scientist-Astronauts, 94, 244.
77. Slayton and Cassutt, Deke!, 211–212.
78. Shayler, NASA’s Scientist-Astronauts, 117.
79. Ibid., 118–120, 244.
80. French and Burgess, In the Shadow of the Moon, 148–149, 203.
83. Atkinson and Shafritz, The Real Stuff, 80.
89. “Aside from the extreme discomfort of storms, landlubber scientists found the most unsettling physical aspect of daily lie at sea to be the rigid and hierarchical arrangement of space in ships.” Rozwadowski, “Small World: Forging a Scientific Maritime Culture for Oceanography,” 414.
90. Wolfe, The Right Stuff, 143, 150.
92. Ibid.
94. Shayler, NASA’s Scientist-Astronauts, 251.
96. Ibid., 10.
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97. Ibid., 11.
98. Shayler, NASA's Scientist-Astronauts, 96.
99. Ibid., 182.
104. Shayler, Skylab, 113.
111. See, for example, Robert Kohler, Lords of the Fly: Drosophila Genetics and the Experimental Life (Chicago: University of Chicago Press, 1994).
112. “Conflict between the goals of scientists and mariners of all levels was deeply rooted in the political culture of ships. Scientists who failed to understand and negotiate the social and political dynamics on board compromised their scientific work.” Rozwadowski, “Small World: Forging a Scientific Maritime Culture for Oceanography,” 418.
115. O'Leary, “Topics: Science or Stunts on the Moon?”
117. Ibid., 220. “Wallich argued constantly with Capt. Leopold McClintock, complaining that they were not employing sounding devices that retrieved bottom samples frequently enough.” Rozwadowski, “Small World: Forging a Scientific Maritime Culture for Oceanography,” 418.
120. Slayton and Cassutt, Deke!, 212.
121. Ibid., 211.
122. Shayler, NASA's Scientist-Astronauts, 244–245.
123. Ibid., 205.
124. Ibid., 190, 244–246.
130. Cunningham, The All-American Boys (Revised Edition), 301.
132. Ibid., 18–19.
133. Ibid., 193–194
134. Ibid., 214–215.
137. Shayler, Skylab, 123.
138. Slayton and Cassutt, Deke!, 271.
139. Cernan and Davis, The Last Man on the Moon, 253, 274.
140. Slayton and Cassutt, Deke!, 271.
142. Slayton and Cassutt, Deke!, 272.
143. Shayler, NASA’s Scientist-Astronauts, 194, 215.
147. Shayler, NASA’s Scientist-Astronauts, 254–255.
148. Slayton and Cassutt, Deke!, 252.
150. Compton and Benson, Living and Working in Space, 220.
152. Shayler, NASA’s Scientist-Astronauts, 101.
155. Shayler, NASA’s Scientist-Astronauts, 240.
160. Shayler, NASA’s Scientist-Astronauts, 257.
162. Ibid., 147–148.
163. Ibid., 148.
4 The Man in the Gray Flannel Spacesuit

4. Ibid., 227.
6. Announced to the public in 1963, this parallel air force human spaceflight program would have employed variants of the launch vehicles and spacecraft of NASA’s Project Gemini. Occupied by non-NASA military crews, MOL would have been used for reconnaissance, satellite inspection, and other missions.
11. C. Gordon Fullerton, “Oral History Transcript (Rebecca Wright, Interviewer),” NASA Johnson Space Center Oral History Project (NASA Dryden Flight Research Center, California, May 6, 2002), 6–8. Fullerton’s experience in flying large aircraft would later serve him well, but he had been received warily in the fighter-driven test pilot community.
17. Hartsfield, “Oral History Transcript (Carol Butler, Interviewer),” 8. Fullerton, like other astronauts of the era, was simultaneously relieved to have avoided service in Vietnam and guilty over his good fortune. Fullerton, “Oral History Transcript (Rebecca Wright, Interviewer),” 6.
22. Many of the MOL pilots who stayed behind enjoyed long military careers as program managers, undamaged by their association with the never-flown MOL.


28. Slayton and Cassutt, _Deke!,_ 266.

29. Cunningham, _The All-American Boys (Revised Edition)_ , 262–263.


36. Muson, “Comedown from the Moon,” 139.


43. Hartsfield, “Oral History Transcript (Carol Butler, Interviewer),” 34.

44. Compton and Benson, _Living and Working in Space_, 289, 310.

47. Ibid., 59–60.
48. Ibid., 49, 61, 57, 68.
50. Ibid., 60–62.
51. Ibid., 65–66.
55. Fletcher described to Low how he respected Conrad’s effort to communicate his concerns, but Fletcher feared, as Kraft had warned, that future discussions with Conrad would be “vitriolic” and “confused.” James C. Fletcher, “Memorandum to George E. Low Re: Resignation of Pete Conrad,” October 17, 1973, Folder 3, Box 57, George M. Low Papers, Archives and Special Collections, Rensselaer Polytechnic Institute, Troy, New York.
57. By the mid-1970s, Skylab’s orbit was already decaying, and, without boosting, the station would likely reenter the atmosphere, potentially striking a populated area. Rookie pilot-astronauts Vance Brand and Don Lind trained to dock with the empty Skylab and fire the Propulsion System of their Apollo Service Module to lower Skylab’s orbital altitude. After firing the engine, Brand and Lind would have had only 14 minutes to close the hatch, undock, and withdraw from Skylab before being dragged down with it or struck by debris as Skylab began to break up in the upper atmosphere. The STS-2A “Skylab Reboost,” an early space shuttle flight scheduled for 1979, would have sent veteran astronauts Fred Haise and Jack Lousma back to Skylab to boost the station into a higher orbit. Unfortunately for the astronauts, repeated delays pushed the first shuttle flight from 1978 to 1981. By then, Skylab had reentered Earth’s atmosphere and Haise had retired. Ultimately, neither mission was flown. Shayler, Skylab, 298–299, 308.
58. Shayler, NASA’s Scientist-Astronauts, 279.
59. Slayton and Cassutt, Deke!, 277.
60. Ibid., 280–281.
64. Ibid.
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66. Ibid., 292. 25 years later, though, an older, wiser Cunningham placed his comments in the past tense. By the time Cunningham published a revised and updated version of his memoir in 2003, his opinion on older astronauts had softened considerably. He concluded a reprise of his earlier comments with a short commentary on the attitudes he had earlier expressed, and noted John Glenn’s shuttle flight at the age of 77: “That representing our thinking in the Seventies!” Cunningham, *The All-American Boys (Revised Edition)*, 340.
70. For Haise, who, following Apollo 13’s return, had been badly burned (and according to Allen, nearly killed) in an airplane crash, the chance to fly *Enterprise* was particularly fortunate. Joseph P. Allen, “Oral History Transcript #2 (Jennifer Ross-Nazzal, Interviewer),” NASA Johnson Space Center Oral History Project (Washington, DC: National Aeronautics and Space Administration, March 16, 2004), 18.
84. During the mid-1970s Young and fellow Apollo veteran T. K. Mattingly forwarded regular memos to NASA managers about unremedied deficiencies in the space shuttle that might gravely impact crew safety. See, for example, “Space Shuttle Costs and Schedules #2,” October 10, 1974, Box 1, Thomas K. Mattingly Files, Center Series, Johnson Space Center History Collection, University of Houston–Clear Lake.
85. Ibid., 352.
86. Ibid.
87. Ibid., 348–349, 351, 361.
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89. Andrew Chaikin, “George Abbey: NASA’s Most Controversial Figure,” Space.com, February 26, 2001.
91. Chaikin, “George Abbey: NASA’s Most Controversial Figure.”
104. Ibid.
105. French and Burgess, In the Shadow of the Moon, 136.
107. French and Burgess, In the Shadow of the Moon, 229.
110. Ibid., 460.
111. Muson, “Comedown from the Moon,” 133.
114. Collins, Carrying the Fire, 461.
118. Ibid., 297; Collins, *Carrying the Fire*, 460–461.
121. Worden, *Falling to Earth*, 243–244.
122. Muson, “Comedown from the Moon,” 140.
124. For example, Bledsoe, “Down from Glory.”
126. Ibid., 37.
134. This particular joke has been decades in the making. See, for example, Thomas Mallon, “Satellite of Love,” *New York Times*, April 9, 2006, F7.

5 Public Space

8. For example, Peter Wolfe, *In the Zone: The Twilight World of Rod Serling* (Bowling Green: Bowling Green State University Popular Press, 1997).
10. For example, Wolfe, *In the Zone*, 100, 125.
14. “…NASA was created expressly for the purpose of conducting peaceful space missions, and the orbiting of a military astronaut will be identified by the world in general as a military gesture, and is sure to be seized upon by the U.S.S.R. for propaganda purposes.” Jerome B. Weisner, “Memorandum for Dr. Bundy,” March 9, 1961, Box 3, Flight Crew Operations Directorate, Center Series, Johnson Space Center History Collection, University of Houston–Clear Lake.
17. Ibid., 58–61.


32. For example, Jasanoff, “Image and Imagination.”


36. See, for example, Jennifer Levasseur, “‘Here’s the Earth Coming up’: Analysis of the Apollo 8 ‘Earthrise’ Photograph” (paper presented at the Annual Meeting of the Society for the History of Technology, Lisbon, Portugal, October 12, 2008).


42. David Sington, “In the Shadow of the Moon” (Discovery Films, 2007).


47. Ibid., 4.


55. “Hearing before the Committee on Science and Astronautics,” April 23, 1974, Folder 004158, NASA Historical Reference Collection, NASA Headquarters, Washington, DC.


60. Bowles, Science in Flux, 224, 227.


64. David J. Shayler, Skylab: America’s Space Station (Chichester, UK: Praxis, 2001), 59.


72. Spacelab would be built by the European Space Agency.


77. O’Leary, “Do We Really Want a Space Shuttle?”


81. Ibid., 296–297.


85. George M. Low, “Handwritten Annotations” May 2, 1972 (typed May 4, 1972) on “Memorandum from General Smart to George Low Re: Post Skylab Assignment for Astronauts,” George M. Low Papers, Folder 1, Box 51, Archives and Special Collections, Rensselaer Polytechnic Institute, Troy, New York.


89. Atkinson and Shafritz, *The Real Stuff*, 139.

90. Shayler, *NASA’s Scientist-Astronauts*, 300.


92. “Meeting Record Re: Shuttle Crew Selection, Fletcher, et al.,” January 23, 1975, Folder 1, Box 104, George M. Low Papers, Archives and Special Collections, Rensselaer Polytechnic Institute, Troy, New York.

94. Following the arrival of Mission Specialists in the 1978, NASA attempted temporarily to redesignate the remaining 1965 and 1967 scientist-astronauts as “Senior Scientist-Astronauts,” but the title did not stick. Shayler, NASA’s Scientist-Astronauts, 328.


96. Shayler, NASA’s Scientist-Astronauts, 287.


101. Ibid.


While it was the policy of NASA not to disclose the reasons for its selection decisions, Robert Gilruth later explained in an internal memorandum that Dwight’s fitness reports and academic credentials were less competitive than those of other applicants. For example, “Memorandum from Robert Gilruth Re: Captain Edward J. Dwight, USAF,” April 16, 1965, Box 2, Flight Crew Operations Directorate, Center Series, Johnson Space Center History Collection, University of Houston–Clear Lake.

120. Ibid., 100.
121. Ibid., 135; Foster, *Integrating Women into the Astronaut Corps*, 51.
122. This spoken-word performance was written and recorded by Gil Scott-Heron in 1970.
125. “Renaming Of The Manned Spacecraft Center,” February 27, 1973, Box 074–31, Apollo Series, Johnson Space Center History Collection, University of Houston–Clear Lake.
127. Ibid., 138.
NOTES

Conclusion
9. In general, though, military space service proved a wise gamble: pilots with only brief service as astronauts in the air force’s MOL program did well in their later careers; one MOL pilot who left space service in 1969 enjoyed a prestigious military career as the head of President Ronald Reagan’s Strategic Defense Initiative.
10. Alcestis R. Oberg, “Ten Years After: Most of the Members of NASA’s ‘Class of ’78’ Are Still Astronauts; Some Have Gone on to Other Jobs; And a Few Have Died,” *Final Frontier*, October 1988, 35–37.
Selected Bibliography

The following sources were consulted extensively in the preparation of this work and will prove valuable to scholars seeking to explore this topic further.

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