

Reference Notes

Chapter 1

1. Lyndon Baines Johnson, *Vantage Point: Perspectives of the Presidency, 1963-1969* (New York: Holt, Rinehart and Winston, 1971), 272; Memo, Excerpts from Speeches, Special Committee on Space and Astronautics, Senate Papers, Box 357, Lyndon B. Johnson Library.
2. Preliminary History of the National Aeronautics and Space Administration During the Administration of President Lyndon B. Johnson, November 1963 to January 1969. Final Edition, NASA, January 15, 1969, I-6, I-7.
3. Documents in the History of NASA: An Anthology, Preliminary Edition, NASA History Office, NASA, Washington, D.C., June 1975, 41,45.
4. Interview, T.H. Baker with Edward C. Welsh, July 18, 1969, Oral History Collection, AC74-268, LBJ Library; and see Walter A. McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, Inc., 1985), 141-145.
5. Robert H. Ferrell, ed., *The Eisenhower Diaries* (New York: W.W. Norton, 1981), 217-359; R. Alton Lee, *Dwight D. Eisenhower: Soldier and Statesman* (Chicago: Nelson-Hall, 1981), 217-291.
6. Memo, Papers Relating to the Armed Services Preparedness Investigating Subcommittee, Other People's Statements on Satellites, Senate Papers, Box 356, LBJ Library (hereafter cited Other People's Statements on Satellites).
7. Other People's Statements on Satellites.
8. Other People's Statements on Satellites; Letter to "My Dear Mr. Secretary," October 11, 1957, Papers Relating to the Armed Services Preparedness Investigating Subcommittee, Senate Papers, Box 355, LBJ Library; Enid Curtis Bok, "The Establishment of NASA: The Political Role of Advisory Scientists," Organization Subseries, JSC History Office.
9. Other People's Statements on Satellites; Memo, Horowitz to Johnson, October 11, 1957, Senate Papers, Box 355, LBJ Library.
10. Other People's Statements on Satellites; Preliminary History of NASA, I-7.
11. Other People's Statements on Satellites.
12. Other People's Statements on Satellites.
13. Inquiry into Satellite and Missile Programs, Hearings before the Preparedness Investigating Subcommittee of the Committee on Armed Services, 85th Cong., 1st and 2nd Sess., Part I: 1-2 (hereafter cited Preparedness Subcommittee Hearings).
14. Preparedness Subcommittee Hearings, I:1-2.
15. Preparedness Subcommittee Hearings, I:1-2.
16. Preparedness Subcommittee Hearings, I:3.
17. Preparedness Subcommittee Hearings, I:1-2.
18. Johnson, 1971, 271.
19. Preparedness Subcommittee Hearings, I:4-20, 21-22, 23-57.
20. Preparedness Subcommittee Hearings, I:57.
21. Preparedness Subcommittee Hearings, I:57-89.
22. Preparedness Subcommittee Hearings, I:111-141.
23. Neil McAleer (with introduction by Chuck Yeager), *The Omni Space Almanac: A Complete Guide to the Space Age* (New York: World Almanac, 1987), 11.
24. McAleer, 1987, 10-12; McDougall, 1985, 76-77.
25. McAleer, 1987, 10; McDougall, 1985, 76-77.

26. David S. Akens, *Historical Origins of the George C. Marshall Space Flight Center*, MSFC Historical Monograph No. 1, MSFC, NASA, Huntsville, Alabama, December 1960, 23-24; McDougall, 1985, 77-78.
27. Akens, 1960, 24-26.
28. Akens, 1960, 26-28; Preparedness Subcommittee Hearings, I:578-579.
29. Akens, 1960, 26-28.
30. Documents in the History of NASA: An Anthology, 1975, 42.
31. Documents in the History of NASA: An Anthology, 1975, 27-29; Jane Van Nimmen and Leonard C. Bruno with Robert L. Rosholt, *NASA Historical Data Book*, NASA SP-4012 (Washington, D.C.: 1988), I:423-424.
32. Van Nimmen, 1988, I:423-424; Preparedness Subcommittee Hearings, I:539-577.
33. Documents in the History of NASA, An Anthology, 1975, 29-39.
34. James R. Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958*, NASA SP-4305 (Washington, D.C.: NASA Scientific and Technical Office, 1987), 271- 309.
35. Hansen, 1987, 1-22.
36. Hansen, 1987, 9.
37. Hansen, 1987, 16-18.
38. Hansen, 1987, 301-302, 385-389.
39. Hansen, 1987, 385-389; and see NASA/JSC Biographical Data Files.
40. "Robert Rowe Gilruth," Biographical Data Subseries, JSC History Office; Interview, Robert B. Merrifield with Paul Purser, May 17, 1967, MSC, Houston, Texas, in Oral History Series, JSC History Office; Hansen, 1987, 262-267, 276-278, 385-389.
41. "Statement to the Wire Services, December 16, 1958," and Memorandum, "George to Senator Johnson," in Papers Relating to the Armed Services Preparedness Investigating Subcommittee, Senate Papers, Box 355, LBJ Library.
42. McAleer, 1987, 13; Preliminary History of NASA, I-9,10, and see notes, I-71 to 74.
43. Memorandum, Clinton P. Anderson, Papers Relating to the Special Committee on Space and Astronautics, Senate Papers, Box 357, LBJ Library.
44. Staff Report of the Select Committee on Astronautics and Space Exploration, *The Next Ten Years in Space, 1959-1969*, 86th Cong., 1st Sess., House Doc. No. 115 (Washington, D.C.: Government Printing Office, 1959); Arnold S. Levine, *Managing NASA in the Apollo Era*, NASA History Series, NASA SP-4102 (Washington, D.C.: 1982), 12-13.
45. Johnson, 1972, 276-277.
46. "Introduction to Outer Space, The White House, March 26, 1958," in Documents in the History of NASA, An Anthology, 1975, 51.
47. Introduction to Outer Space, 50-59.
48. Memorandum for the Secretary of Defense and Chairman, The National Advisory Committee for Aeronautics, April 2, 1958, Special Committee on Space and Astronautics, Senate Papers, Box 357, LBJ Library. (Note: NASA Historical Data Book, I:4, incorrectly notes that the bill was submitted to Congress on April 14.)
49. Senate papers, Box 357, LBJ Library.
50. NASA Act 1958, 85th Congress, Second Session, Report 2166, July 15, 1958.
51. Astronautics and Space Exploration, Hearings before the Select Committee on Astronautics and Space Exploration, 85th Cong., 2nd Sess., 401-410.

52. Hansen, 1987, 385-86; Letter, Bill Stoney to Dethloff, March 1, 1990.
53. Memorandum, "Statement by the President," February 19, 1973; Wright Patman, "The Lyndon Baines Johnson Space Center," *Congressional Record*, Extensions of Remarks, January 26, 1973, E-467, in Organization Subseries, JSC History Office.

Chapter 2

1. Dr. Robert R. Gilruth, "Memoir: From Wallops Island to Mercury, 1945-1958," presented at the Sixth International History of Astronautics Symposium, Vienna, Austria, October 13, 1972, in Vertical Files, JSC History Office, 29 (hereafter cited Gilruth Memoir, 1972.)
2. Interview, Robert B. Merrifield with Abe Silverstein, Washington D.C., January 30, 1969, in Oral History Series, JSC History Office.
3. Gilruth Memoir, 1972, 36-39.
4. Gilruth Memoir, 1972, 34-38; Interview, Merrifield with Silverstein, 1969, 1-3; *Report on the Activities of the Committee on Science and Astronautics*, 86th Cong., 1st Sess., House Doc. No. 32, i-iii, 1; "Authorizing Construction for the National Aeronautics and Space Administration," *Hearings before the Select Committee on Astronautics and Space Exploration*, 85th Cong., 2nd. Sess., August 1, 1958, 17-21.
5. Lyndon B. Johnson, "The Space Age and the Engineer," *American Engineer* (August 1958) V. 28, no. 8:11-14.
6. "Statement of Dr. T. Keith Glennan, Administrator, National Aeronautics and Space Administration before the House Committee on Science and Astronautics," February 2, 1959, and "T. Keith Glennan," Biographical Data, in Olin E. Teague Papers, "Early Organization," Texas A&M University Archives, Box 222. Preliminary History of the National Aeronautics and Space Administration During the Administration of President Lyndon B. Johnson, November 1963 - January 1969, Final Edition, NASA, January 15, 1969, I-15 to I-16; Documents in the History of NASA: An Anthology, Preliminary Edition, NASA History Office, Washington, D.C., June 1975, 104-106.
7. Gilruth Memoir, 1972, 39-40. Note: Members of the joint committee included Gilruth (Chairman), Dr. S.B. Batdorf (ARPA), Dr. A.J. Eggers (NASA), Maxime Faget (NASA), George Low (NASA), Warren North (NASA), Walter Williams (NASA), and Robertson Youngquist (ARPA); Paul E. Purser, "Log for Week of October 6, 1958," Purser Logs to Gilruth Subseries, JSC History Office.
8. Glennan Statement, 1959, 6; Interview, Robert B. Merrifield with Wesley L. Hjernevik, March 9, July 1, and September 9, 1967, Oral History Series, JSC History Office.
9. Gilruth Memoir, 1972, 39-41 and Appendix B.
10. Gilruth Memoir, 1972, Appendix B; Purser, "Log for Week of October 20, 1958," and "Log for Week of October 28, 1958," Purser Logs to Gilruth Subseries, JSC History Office.
11. Gilruth Memoir, 1972, Appendix B.
12. Gilruth Memoir, 1972, 35-45; Interview, Merrifield with Silverstein, 1969; Interview, Robert B. Merrifield with George M. Low, JSC, Houston, Texas, January 9, 14, 1968, February 4, 1969, in Oral History Series, JSC History Office.
13. Interview, Merrifield with Low, 1968.
14. Gilruth Memoir, 1972, 42.
15. Interview Merrifield with Silverstein, 1969; James R. Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958*, NASA SP-4305 (Washington, D.C.: 1987), 385.
16. Interview, Merrifield with Silverstein, 1969; Interview, Merrifield with Low, 1968; Gilruth Memoir, 1972, 36-41.

17. Gilruth Memoir, 1972, 43-44; Biographical, "Charles J. Donlan, Associate Director, Langley Research Center," Biographical Data Subseries, JSC History Office.
18. Gilruth Memoir, 1972, 43.
19. Gilruth Memoir, 1972, 44; Preliminary History of NASA, 1969, I-18.
20. Gilruth Memoir, 1972, 42-43.
21. Gilruth Memoir, 1972, 44-45.
22. Gilruth Memoir, 1972, 47.
23. Interview, Henry C. Dethloff with R. Bryan Erb, JSC, Houston, Texas, February 15, 1989, Oral History Series, JSC History Office.
24. Interview, Dethloff with Erb, 1989; Interview, Henry C. Dethloff with Rodney Rose, Wimberly, Texas, February 24, 1989, Oral History Series, JSC History Office.
25. Interview, Dethloff with Rose, 1989.
26. Interview, Dethloff with Rose, 1989.
27. Interview, Dethloff with Erb and with Rose, 1989.
28. Interview, Dethloff with Rose and with Erb, 1989.
29. Interview, Dethloff with Rose and with Erb, 1989; Memorandum, "English/Canadians from AVRO" in Organization Subseries, JSC History Office.
30. Interview, Merrifield with Silverstein, 1969; and with Low, 1968; Interview, Henry C. Dethloff with Oran Nicks, College Station, Texas, February 17, 1989.
31. Interview, Merrifield with Silverstein, 1969.
32. David S. Akens, *Historical Origins of the George C. Marshall Space Flight Center* (Washington, D.C.: NASA History Office, December 1963), 67-83.
33. Akens, 1963, 67-83.
34. Preliminary History of NASA, 1969, I-23 - I-24; Interview, Oran W. Nicks with T. Keith Glennan, May 11, 1982, Reston, Virginia, personal files of Oran Nicks, College Station, Texas; and see Ken Hecnler, *Toward the Endless Frontier: History of the Committee on Science and Technology, 1959-1979* (Washington, D.C., U.S. House of Representatives: Government Printing Office, 1980), 1-1073.
35. Preliminary History of NASA, 1969, I-23 - I-24.
36. Lyndon B. Johnson, *The Vantage Point: Perspectives of the Presidency, 1963-1969* (New York: Holt, Rinehart & Winston, 1971), 278-279; Ken Belieu, Memorandum for Senator Johnson, "Governmental Organization for Space Activities," December 17, 1960, and "Space Problems," December 22, 1960, in Vice Presidential Security File, Box 17, LBJ Library.
37. Johnson, 1971, 278-279.
38. Johnson, 1971, 278.
39. Preliminary History of NASA, 1969, I-26; Interview, Dethloff with Nicks, 1989.
40. Johnson, 1971, 279-280.
41. Johnson, 1971, 280.
42. Johnson, 1971, 280-281; Preliminary History of NASA, 1969, I-28 - I-32; Interview, T.H. Baker with Dr. Edward C. Welsh, July 18, 1969, Oral History Collection, LBJ Library, 12-16.
43. Johnson, 1971, 280-281.
44. Preliminary History of NASA, 1969, I-30 - I-32.
45. Preliminary History of NASA, 1969, I-33 - I-34.

46. Johnson, 1971, 280-281.
47. *The Practical Values of Space Exploration: Staff Study of the Committee on Science and Astronautics*, House of Representatives, 87th Cong., 1st Sess., August 17, 1961 (Washington, D.C.: Government Printing Office, 1961), 1- 51.
48. Interview, Merrifield with Silverstein, 1969.
49. Preliminary History of NASA, 1969, I-35; Interview, Dethloff with Nicks, 1989; Arnold S. Levine, *Managing NASA in the Apollo Era*, NASA SP-4102 (Washington, D.C.: 1982), 18-20, 307-312.
50. Howard Benedict, *NASA: A Quarter Century of Achievement* (The Woodlands, Texas: Pioneer Publications, Inc., 1984), 10-11.
51. Benedict, 1984, 10-11; Gilruth Memoir, 1972, 49-50.
52. NASA News Release 61-207, September 19, 1961.

Chapter 3

1. Paul E. Purser, "Log for Week of December 4, 1958," Purser Logs to Gilruth Subseries, JSC History Office.
2. Interview, Robert B. Merrifield with Abe Silverstein, Washington, D.C., January 30, 1969; Interview, Robert B. Merrifield with George M. Low, JSC, January 9, 14, 1968, February 4, 1969, Oral History Series, JSC History Office; Robert R. Gilruth, Memorandum for Staff, Organization Subseries, JSC History Office; Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 7-19. Note: George Low recalled that the decision to create a separate center for the STG was made by Abe Silverstein in Silverstein's office, with he and Wesley Hjernevik present. Hjernevik indicates that the decision was initiated by Glennan and Dryden.
3. Interview, Merrifield with Low, 1968 and 1969, 3-4; Interview, Merrifield with Wesley L. Hjernevik, March 9, July 1, and September 9, 1967, 6-10; Memorandum for Associate Administrator, November 18, 1960, Organization Subseries, JSC History Office.
4. (Note: Hjernevik identifies Langley as one of the locations precluded by Glennan, but this does not appear in *Chariots for Apollo*); see Brooks, Grimwood, and Swenson, Jr., 1979, 7-8, 19-20. (Note: Members of the "Manned Lunar Landing Committee" now included Eldon Hall, Oran W. Nicks, Alfred M. Mayo, Ernest O. Pearson, Max Faget, and Heinz H. Koelle).
5. Brooks, Grimwood, and Swenson, 1979, 19.
6. Brooks, Grimwood, and Swenson, 1979, 19; Memorandum, "Manned Spacecraft Development Center, Organizational Concepts and Staffing Requirements," Organization Subseries, JSC History Office.
7. Interview, Merrifield with Low, 1968 and 1969.
8. N. Philip Miller, "Memorandum for the Record," Organization Subseries, JSC History Office.
9. Interview, Robert B. Merrifield with Max Faget, October 16, 1967; Interview, Merrifield with Paul G. Dembling, September 25, 1969; Interview, Merrifield with Col. John A. Powers, November 9, 1968, Oral History Series, JSC History Office; Interview, Henry C. Dethloff with Paul Purser, David Lang and Bill Petynia, January 18, 1989; and see correspondence in Olin E. Teague Papers, Texas A&M University Archives, Box 222.
10. Memorandum for All Mercury Personnel, November 23, 1960; Memorandum for Staff, September 16, 1960; T. Keith Glennan to Marvin G. Miles, August 26, 1960; "Astronaut Plans Well Conceived," *Los Angeles Times* (August 21, 1960), Organization Subseries, JSC History Office.
11. "Space Task Group, Langley Field, Virginia, Organizational History," Organization Subseries, JSC History Office.

12. Memorandum for Staff, January 23, 1961, "Progress Report by the House Committee on Science and Astronautics," Organization Subseries, JSC History Office.
13. Olin E. Teague Papers, Box 222; James E. Webb, Memorandum for the President, September 14, 1961, Organization Subseries, JSC History Office.
14. Webb Memorandum for the President, 1961.
15. Interview, Robert B. Merrifield with I. Edward Campagna, August 24, 1967, Oral History Series, JSC History Office.
16. Interview, Merrifield with Powers, 1968.
17. Webb Memorandum for the President, 1961.
18. NASA News Release 61-207, September 19, 1961; NASA News Release, 61-189, August 24, 1961; "Memorandum on Manned Space Flight Laboratory," Olin E. Teague Papers, Box 222.
19. Interview, Robert B. Merrifield with Robert R. Gilruth, April 17, 1969, Oral History Series, JSC History Office.
20. Interview, Robert B. Merrifield with Martin A. Byrnes, Jr., December 12, 1967, 18, Oral History Series, JSC History Office.
21. Interview, Merrifield with Byrnes, 1967, 18; Interview, Merrifield with Hjernevik, 1967, 20, 35.
22. *Houston Press* (September 20, 1961); *Houston Chronicle* (September 20, 24, 1961).
23. Interview, Robert B. Merrifield with W.A. Parker, May 16, 1967, Oral History Series, JSC History Office.
24. Interview, Merrifield with Low, 1969.
25. Interview, Merrifield with Powers, 1968.
26. Interview, Robert B. Merrifield with Grace Winn, Houston, Texas, June 3, 1968, Oral History Series, JSC History Office.
27. Interview, Merrifield with Winn, 1968.
28. Interview, Merrifield with Winn, 1968.
29. Interview, Merrifield with Winn, 1968; Interview, Henry C. Dethloff with Max Faget, Houston, Texas, March 15, 1989, Oral History Series, JSC History Office.
30. Interview, Merrifield with Winn, 1968; MSC Announcement 44, April 18, 1962, General Reference Series, JSC History Office; "Comments on the Preliminary draft of Chapter 2," by Lester Sullivan, undated, JSC History Office.
31. Interview, Merrifield with Winn, 1968; Interview, Merrifield with Hjernevik, 1967.
32. "STG Renamed: Will Move," *Space News Roundup* (hereafter cited *Roundup*) (November 1, 1961), JSC History Office 1, 3; MSC Announcement 2, November 1, 1961, General Reference Series, JSC History Office.
33. Interview, Merrifield with Parker, 1967.
34. Interview, Merrifield with Parker, 1967.
35. Interview, Merrifield with Parker, 1967.
36. Interview, Merrifield with Byrnes, 1967.
37. Interview, Merrifield with Byrnes, 1967.
38. Interview, Merrifield with Byrnes, 1967.
39. Interview, Merrifield with Byrnes, 1967.
40. Interview, Merrifield with Byrnes, 1967; Interview, Robert B. Merrifield with James M. Bayne, December 9, 1968.

41. Interview, Merrifield with Hjernevik, 1967; Interview, Dethloff with Faget, 1989; Interview, Merrifield with A. Malcom Lovett, January 21, 1971; MSC Announcement 21, February 26, 1962, General Reference Series, JSC History Office.
42. Interview, Merrifield with Campagna, 1967.
43. Interview, Merrifield with Campagna, 1967.
44. Interview, Merrifield with Campagna, 1967; Interview, Dethloff with Faget, 1989; Memorandum, "File on Gemini for Apollo, June 2, 1962, Organization Subseries, JSC History Office; Interview, Merrifield with Gilruth, 1969.
45. Memorandum, Manned Spacecraft Center for the National Aeronautics and Space Administration, Clear Lake, Harris County, Texas, "Background and History of Development of Master Plan and Architectural Concept for Construction of Facilities," Organization Subseries, JSC History Office.
46. Memorandum, MSC.
47. Memorandum, Paul Purser, "Institutional Planning for the Manned Spacecraft Center," July 22, 1968, Vertical Files, JSC History Office.
48. *Roundup* (June 27, 1962).
49. *Roundup* (September 19, 1962); MSC Announcement 6, September 11, 1962, General Reference Series, JSC History Office.

Chapter 4

1. "Gilruth Cites MSC Progress Despite Difficult Relocation," JSC, Houston, Texas, *Space News Roundup* (hereafter cited *Roundup*) (July 11, 1962).
2. *Roundup*, July 11, 1962.
3. *Roundup* (New York: World Almanac, 1987), 17-18.
4. *Roundup* (May 30, 1962).
5. *Roundup* (May 30, 1962).
6. Barton C. Hacker and James M. Grimwood, *On Shoulders of Titans: A History of Project Gemini*, NASA SP-4203 (Washington, D.C.:NASA, 1977), 1-9.
7. Hacker and Grimwood, 1977, 1-46; Courtney G. Brooks, James M. Grimwood, and Lloyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: NASA, 1979), 1-39.
8. Interview, Robert B. Merrifield with George M. Low, January 9, 14, and February 4, 1969, Oral History Series, JSC History Office.
9. Interview, Merrifield with Low, 1969.
10. Interview, Merrifield with Low, 1969.
11. Interview, Merrifield with Low, 1969.
12. Interview, Henry C. Dethloff and Oran Nicks with W. Hewitt Phillips and Robert G. Chilton, College Station, Texas, March 24, 1989, Oral History Series, JSC History Office.
13. Enid Curtis Bok, "The Establishment of NASA: The Political Role of Advisory Scientists," presented to the American Association for the Advancement of Science, Philadelphia, 1962, Organization Subseries, JSC History Office.
14. Interview, Henry C. Dethloff with Max Faget, NASA/JSC, March 15, 1989.
15. Interview, Henry C. Dethloff with Paul Purser, January 18, 1989, Oral History Series, JSC History Office.

16. R. Wayne Young, *The Utilization of Project Management Concepts at the NASA Johnson Space Center*, Unpublished doctoral dissertation, Graduate School of Public Affairs, University of Colorado, 1983, 209-211; Interview, Henry C. Dethloff with Robert Piland, The Woodlands, Texas, April 13, 1989.
17. "Charles J. Donlon," "Walter C. Williams," "Kenneth S. Kleinknecht," Biographical Data Subseries, JSC History Office; James R. Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958*, NASA SP-4305 (Washington D.C.: 1987), 300-301; "Space Task Group, Langley Field, Virginia, Organizational History," September 1961, 1-5, Organization Subseries, JSC History Office.
18. Interview, Robert B. Merrifield with Wesley L. Hjernevik, March 9, July 1, and September 9, 1967, Oral History Series, JSC History Office; Interview, Henry C. Dethloff with Wesley L. Hjernevik, Wimberley, Texas, February 23, 1989.
19. Interview, Merrifield with Hjernevik, 1967; Interview, Dethloff with Hjernevik, 1989; Interview, Henry C. Dethloff with Paul Purser, David Lang and Bill Petynia, JSC, January 18, 1989, Oral History Series, JSC History Office.
20. Interview, Dethloff with Hjernevik, 1989; and see Wesley L. Hjernevik, "NASA Programs and Their Management," delivered to the Harvard Business School Club of Houston, Texas, January 28, 1964, Organization Subseries, JSC History Office.
21. Interview, Dethloff with Hjernevik, 1989; Interview, Merrifield with Hjernevik, March 9, 1967.
22. Interview, Merrifield with Hjernevik, 1967.
23. MSC Announcement 7, January 15, 1962, General Reference Series, JSC History Office.
24. MSC Announcement 8, January 15, 1962, General Reference Series, JSC History Office.
25. Interview, Robert B. Merrifield with Joseph P. Loftus, Jr., March 16, 1971, Oral History Series, JSC History Office; Interview, Henry C. Dethloff with Joseph P. Loftus, Jr., January 6, 1989; Interview, Dethloff with Piland, 1989.
26. Interview, Merrifield with Loftus, 1971; Interview, Dethloff with Loftus, 1989; Interview, Dethloff with Piland, 1989; and MSC Announcement 8, January 15, 1962, General Reference Series, JSC History Office.
27. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 1-29; Organizational charts, September 26, 1960, May 23, 1961, Organization Subseries, JSC History Office.
28. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 7-11; Guidelines for Advanced Manned Space Vehicles prepared by Flight Systems Division, March 1960, Apollo Series, JSC History Office.
29. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 37-39.
30. MSC Announcement 21, February 26, 1962, General Reference Series, JSC History Office.
31. Memorandum, "MSC Senior Staff Meetings," March 30, 1962; Memorandum, "Meetings," April 9, 1962; Memorandum, "Summer Vacations for Staff," June 20, 1962, Organization Subseries, JSC History Office.
32. Interview, Henry C. Dethloff with Max Faget, July 12, 1989; Interview, Dethloff with Piland, 1989; MSC Announcement 8, January 15, 1962, General Reference Series, JSC History Office.
33. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 1-29; Organizational charts, September 26, 1969; May 23, 1961, Organization Subseries, JSC History Office.
34. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 7-11; Guidelines for Advanced Manned Space Vehicles prepared by Flight Systems Division, March 1960, Apollo Series, JSC History Office.
35. Interview, Dethloff with Piland, 1989; Brooks, Grimwood and Swenson, 1979, 37-39.
36. MSC Announcement 21, February 26, 1962, General Reference Series, JSC History Office.
37. Interview, Henry C. Dethloff with Dennis Fielder, JSC, July 17, 1989.

38. Memorandum, "MSC Senior Staff Meetings," March 30, 1962; Memorandum, "Meetings," April 9, 1962; Memorandum, "Summer Vacations for Staff," June 20, 1962, Organization Subseries, JSC History Office.
39. Virginia F. McKenzie, "Living in a Space Community," *Space News Roundup* (hereafter *Roundup*) (July 14, 1989); Interview, Robert B. Merrifield with Grace Winn, Houston, Texas, June 3, 1968.
40. *Roundup* (October 3, 1962); *Roundup* (October 17, 1962).
41. *Roundup* (October 17, 1962).
42. *Roundup* (June 26, 1963).
43. Interview, Merrifield with Low, 1969; Interview, Dethloff with Piland, 1989; *Roundup* (March 7, 1962).
44. Interview, Merrifield with Low, 1969; Interview, Dethloff with Piland, 1989; *Roundup* (March 7, 1962); Note: Piland sees Shea as a key combatant with the Golovin Committee which reviewed modes of lunar flight including direct ascent, earth-orbit rendezvous, lunar-orbit rendezvous or lunar-surface mission.
45. Brooks, Grimwood and Swenson, 1979, 56-59; NASA, Office of Management, Management Processes Branch, "The Evolution of the NASA Organization" (March 1985), Organization Subseries, JSC History Office, 21-22.
46. Interview, Merrifield with Low, 1969; Brooks, Grimwood and Swenson, 1979, 127-128; Linda Neuman Ezell, *NASA Historical Data Book, II, Programs and Projects 1958-1968*, NASA SP-4012 (Washington, D.C.: 1988), 101-111.
47. *Roundup* (April 18, 1962); *Roundup* (July 10, 1963); Grumman Aircraft Engineering Corporation, Project Apollo Feasibility Study Summary, May 15, 1961, v. IV, Apollo Series, JSC History Office.
48. *Roundup* (May 2, 1962); Ezell, 1988, 56-58; Brooks, Grimwood and Swenson, 1979, 87-166; and see Roger E. Bilstein, *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles*, NASA SP-4206, (Washington, D.C.: Government Printing Office, 1980); and Charles D. Benson and William B. Faherty, *Moonport: A History of Apollo Launch Facilities and Operations*, NASA SP-4204, (Washington, D.C.: Government Printing Office, 1978).
49. Ezell, 1988, 56-61, 171-194; and see Brooks, Grimwood and Swenson, 1979, 87-188.
50. MSC Announcement 268, November 5, 1963, MSC Announcement 274, November 21, 1963, General Reference Series, JSC History Office; *Roundup* (November 27, 1963).
51. *Roundup* (January 6, 1965).
52. Letter, George E. Mueller to Robert R. Gilruth (October 4, 1964); Memorandum, Robert R. Gilruth to MSC Senior Staff, October 5, 1964, w/enclosure "Presentation by Dr. George E. Mueller before the Senior Staff, MSC, Houston, Texas, October 5, 1964, Organization Subseries, JSC History Office.
53. Letter, Mueller to Gilruth, 1964.
54. Letter, Mueller to Gilruth, 1964.

Chapter 5

1. *Space News Roundup* (hereafter *Roundup*) (April 15, 1964).
2. Barton C. Hacker and James M. Grimwood, *On Shoulders of Titans: A History of Project Gemini*, NASA SP-4203 (Washington, D.C.: 1977); *Welcome to MSC Roundup* (1964).
3. *Welcome to MSC Roundup* (1964).
4. Interview, Robert B. Merrifield with Paul Haney, Houston, Texas, April 8, 1968, Oral History Series, JSC History Office.
5. Interview, Merrifield with Haney, 1968.
6. Interview, Merrifield with Haney, 1968.

7. Interview, Merrifield with Haney, 1968.
8. *Welcome to MSC Roundup* (1964).
9. Telephone interview, Henry C. Dethloff with Max Faget, December 5, 1989.
10. Linda Neuman Ezell, *NASA Historical Data Book, II, Programs and Projects, 1958-1968*, NASA SP-4012 (Washington, D.C.: 1988), 149-170; Hacker and Grimwood, 1977, 1-50
11. Hacker and Grimwood, 1977, 3-5.
12. Hacker and Grimwood, 1977, 1-50; Ezell, 1988, 155-156.
13. James A. Chamberlin, "Biographical Data," Biographical Data Subseries, JSC History Office.
14. Chamberlin, Biographical Data Subseries.
15. Gemini Spacecraft Contract, Financial Management and Cost Documents, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas.
16. Gemini Spacecraft Contract.
17. Hacker and Grimwood, 1977, 57, 64, 76, 95-98; Ezell, 1988, 121, 123, 126-127.
18. Interview, Robert B. Merrifield with Paul Purser, May 17, 1967.
19. Interview, Robert B. Merrifield with Robert G. Chilton, March 30, 1970; Interview, Henry C. Dethloff with Max Faget, March 15, 1989.
20. Interview, Robert B. Merrifield with Joseph P. Loftus, March 16, 1971.
21. Interview, Henry C. Dethloff with Henry Pohl, May 16, 1989.
22. Interview, Merrifield with Purser, 1967; Interview with Merrifield with Loftus, 1971; Interview, Robert B. Merrifield with Christopher C. Kraft, Jr., October 5, 1967.
23. *Roundup* (January 8, 1964).
24. *Roundup*, 1964.
25. Interview, Henry C. Dethloff with Dennis Fielder, July 17, 1989.
26. The interviews available in the Oral History Series of the JSC History Office that particularly relate to the development of the operations and flight control aspects of the center and focus on Mercury and Gemini flights include interviews, Henry C. Dethloff with Dennis Fielder, July 17, 1989; Dethloff with Christopher C. Kraft, Jr., July 12, 1989; Robert B. Merrifield with Fielder, March 21, 1968; Merrifield with Kraft, October 5, 1967; Merrifield with John D. Hodge, March 15 and 18, 1968.
27. Interviews, Dethloff with Fielder and Kraft, 1989; Interviews, Merrifield with Fielder, Kraft, and Hodge, 1967 and 1968.
28. Interview, Merrifield with Hodge, 1968.
29. Interview, Merrifield with Kraft, 1967.
30. Interviews, Dethloff with Fielder and Kraft, 1989; Interviews, Merrifield with Fielder, Kraft, and Hodge, 1967 and 1968.
31. Interviews, Dethloff with Fielder and Kraft, 1989; Interviews, Merrifield with Fielder, Kraft, and Hodge, 1967 and 1968.
32. Interview, Merrifield with Kraft, 1967.
33. Interview, Merrifield with Kraft, 1967.
34. Interview, Merrifield with Kraft, 1967.
35. Interviews, Merrifield with Fielder, Kraft, and Hodge, 1967 and 1968; Interviews, Dethloff with Fielder and Kraft, 1989.

36. Interview, Merrifield with Kraft, 1967; Interview, Merrifield with Hodge, 1968.
37. Interview, Merrifield with Kraft, 1967; Interview, Dethloff with Kraft, 1989; Interview, Merrifield with Hodge, 1968.
38. Interview, Merrifield with Kraft, 1967; Interview, Dethloff with Kraft, 1989; Interview, Merrifield with Hodge, 1968.
39. Interview, Robert B. Merrifield with James C. Elms, July 30, 1968.
40. Interview, Merrifield with Elms, 1968.
41. Interview, Merrifield with Elms, 1968.
42. Interview, Merrifield with Elms, 1968.
43. Interview, Merrifield with Elms, 1968.
44. Interview, Merrifield with Elms, 1968.; *Roundup* (November 13, 1963).
45. *Roundup* (November 13, 1963); and see MSC Announcements, 287-293, January 3, 1964; 64-113, August 11, 1964; 64-148, October 21, 1964; 64-21, February 20, 1964; 64-34, March 12, 1964; 64-52, April 14, 1964; 64-64, April 30, 1964; 64-65, May 1, 1964; 64-66, May 1, 1964, and other related announcements, General Reference Series, JSC History Office.
46. *Roundup* (January 22, 1964); MSC Announcement 64-2, January 17, 1964; 64-5, January 21, 1964, General Reference Series, JSC History Office. After the reorganization, Graves and Frick left MSC. Walter Williams also departed to become Operations Director at NASA headquarters under Dr. George E. Mueller.
47. *Roundup* (December 9, 1964), (January 20, 1965), (February 3, 1965), (March 19, 1965), (April 2, 1965); Ezell, 1988, 149-170.
48. *Roundup* (March 4, 1964), (June 10, 1964), (February 3, 1965).
49. Wesley L. Hjernevik, Assistant Director for Administration, "NASA Programs and Their Management," January 28, 1964, Organization Subseries, JSC History Office.
50. Gemini Spacecraft Contract.
51. "Introduction to Configuration Management for Management Interns," n.d., JSC Management Subseries, JSC History Office; "Apollo Spacecraft Program Office, Configuration Management Plan," March 19, 1965 (Revision B, dated March 15, 1966), Apollo Series, JSC History Office.
52. "Introduction to Configuration Management."
53. "Introduction to Configuration Management."
54. *Roundup* (June 11, 1965).
55. Telephone interview, Joey Pellarin, JSC History Office, with Bishop William Sterling, Episcopal Bishop of Texas, April 10, 1991.
56. Ezell, 1988, 149-170; *Roundup* (August 6, 20, September 3, 17, October 1, 29, December 10, 23, 1965); Interview, Dethloff with Kraft, 1989.
57. Ezell, 1988, 149-170, 184; *Roundup* (February 4, 18, March 4, 18, April 1, 1966).
58. Ezell, 1988, 149-170.
59. Presentation by Dr. Charles Berry, Apollo 20th Anniversary Celebration Speaker's Series, "Planning the Apollo Missions" (not transcribed), July 18, 1989, JSC.
60. Presentations by former flight directors Glynn Lunney, Stephen Bales, Gerald Griffin, and Cliff Charlesworth, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC.
61. Hacker and Grimwood, 1977 xv-xx, 383-389.

Chapter 6

1. John Mecklin, "Jim Webb's Earthy Management of Space," *Fortune* (August 1967), 5-12.
2. For an overview of NASA organization and history see Roger E. Bilstein, *Orders of Magnitude: A History of the NACA and NASA, 1915-1990*, NASA SP-4406 (Washington, D.C.: 1989), and basic center histories including James R. Hansen, *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958*, NASA SP-4305 (Washington, D.C.: 1987); Elizabeth A. Muenger, *Searching the Horizon: A History of Ames Research Center, 1940-1976*, NASA SP-4304 (Washington, D.C.: 1985); Richard P. Hallion, *On the Frontier: Flight Research at Dryden, 1946-1981*, NASA SP-4303 (Washington, D.C.: 1984); Clayton R. Koppes, *JPL and the American Space Program* (New Haven: Yale University Press, 1982); Virginia Dawson, *Engines and Innovation, Lewis Laboratory and American Propulsion Technology*, NASA SP-4306 (Washington, D.C.: 1991); and Joseph Adams Shortal, *A New Dimension, Wallops Island Flight Test Range: The First Fifteen Years*, NASA RP-1028 (Washington, D.C.: 1978); Edwin P. Hartman, *Adventures in Research: A History of the Ames Research Center, 1940-1965*, NASA SP-4302 (Washington, D.C.: 1970); and Interview, Henry C. Dethloff with Donald L. Hess, JSC, September 20, 1989; and see *NASA Historical Data Book, I, NASA Resources, 1958-1968*, NASA SP-4012 (Washington, D.C.: 1988), 245.
3. *NASA Historical Data Book, I*, 269-539.
4. *NASA Historical Data Book, I*, 269-539.
5. Alfred Rosenthal, *Venture into Space: Early Years of Goddard Space Flight Center* NASA SP-4301 (Washington, D.C.: NASA, 1968); William B. Faherty, *Moonport: A History of Apollo Launch Facilities and Operations*, NASA SP-4204 (Washington, D.C.: Government Printing Office, 1978); Interview, Dethloff with Hess, 1989.
6. James R. Hansen, 1987, 392-393; John Logsdon interview with George Mueller and others, July 21, 1989, JSC; Interview, Henry C. Dethloff with George Mueller, July 21, 1989; Interview, Henry C. Dethloff with Aleck C. Bond and Jerome B. Hammack, JSC, September 14, 1989.
7. Interview, Henry C. Dethloff with Dr. Chris Kraft, Houston, Texas, April 2, 1991.
8. Interview, Dethloff with Kraft, 1991; Interview, Henry C. Dethloff with Oran Nicks, College Station, Texas, October 20, 1989; telephone interview, Dethloff with Joseph P. Loftus, October 20, 1989; James E. Webb, lectures presented in the McKinsey Foundation Lecture Series at the Graduate School of Business, Columbia University, New York, New York; I, Doctrine and Practice in Large Scale Endeavors, May 2, 1968, 4; and see also Goal Setting and Feedback in Large Scale Endeavors, May 9, 1968; and Executive Performance and Its Evaluation, May 16, 1968; Vertical Files, JSC History Office.
9. Arnold S. Levine, *Managing NASA in the Apollo Era*, NASA SP-4102 (Washington, D.C.: 1982), 61-64, 175.
10. Dr. George E. Mueller, "Biographical Data," Biographical Data Subseries, JSC History Office.
11. Interview, Logsdon with Mueller and others, 1989.
12. Interview, Dethloff with Bond and Hammack, 1989.
13. Interview, Logsdon with Mueller and others, 1989; Levine, 1982, 174-175.
14. Interview, Logsdon with Mueller and others, 1989; Levine, 1982, 174-175; Interview, Henry C. Dethloff with Oran Nicks, College Station, Texas, August 22, 1989.
15. Levine, 1982, 174-175; Interview, Dethloff with Bond and Hammack, 1989.
16. Interview, Loyd Swenson and James M. Grimwood with Kenneth S. Kleinknecht, JSC, March 6, 1970, Oral History Series, JSC History Office; critique of preliminary Chapter 6 draft by Rodney Rose, undated, Intaglio Files and Papers.
17. "Apollo Program Development Plan, 15 January 1965," Apollo Series, JSC History Office, xiii, xiv.
18. "Apollo Development Plan," 1965, 1-12, 1-13/1-14.

19. "Apollo Development Plan," 1965, 1-12, 1-13/1-14.; Note: the Panel Review Boards included Crew Safety, Flight Evaluation, Mechanical Design, Instrumentation and Communications, Flight Mechanics, Electrical Systems, Launch Operations, and Flight Operations.
20. Interview, Dethloff with Nicks, 1989.
21. Interview, Dethloff with Bond and Hammack, 1989.
22. Julian Scheer, Washington, D.C., to Paul Haney, MSC Houston, December 2, 1968; George S. Trimble, Deputy Director, MSC, to Julian Scheer, Washington, D.C., December 17, 1968, Apollo Series, JSC History Office.
23. George E. Mueller to Robert R. Gilruth, December 16, 1968, Apollo Series, JSC History Office.
24. Interview, Robert B. Merrifield with George Low, January 9, 14, February 4, 1969, Oral History Series, JSC History Office; Interview, Swenson and Grimwood with Kleinknecht, 1970.
25. Interview, Swenson and Grimwood with Kleinknecht, 1970.
26. Interview, Robert B. Merrifield with Paul Purser, May 17, 1967, Oral History Series, JSC History Office.
27. Alex Roland, ed., *A Spacefaring People: Perspectives on Early Spaceflight*, NASA SP-4405 (Washington, D.C.: 1985), 57-58.
28. Roland, 1985, 57-58.
29. Roland, 1985, 57-58.
30. Interview, Swenson and Grimwood with Kleinknecht, 1970; Interview, Robert B. Merrifield with Max Faget, October 16, 1967, Oral History Series, JSC History Office.
31. Interview, Robert B. Merrifield with Robert R. Gilruth, April 17, 1969, Oral History Series, JSC History Office.
32. Interview, Merrifield with Gilruth, 1969; Interview, Merrifield with Low, 1969; Barton C. Hacker and James M. Grimwood, *On Shoulders of Titans: A History of Project Gemini*, NASA SP-4203 (Washington, D.C.: 1977), 111-114, 144, 161, 200.
33. Interview, Merrifield with Faget, 1967; Interview, Merrifield with Gilruth, 1969; and see William David Compton, *Where No Man Has Gone Before*, NASA SP-4214 (Washington, D.C.: 1989).
34. Interview, Merrifield with Gilruth, 1969; Interview, Merrifield with Low, 1969.
35. Interview, Merrifield with Gilruth, 1969; Interview, Merrifield with Low, 1969; Interview, Merrifield with Faget, 1967.
36. "Marshall May Take 2nd Apollo Control," *Houston Post* (October 14, 1965), 22; *Houston Post* (October 10, 1966), 1-6.
37. *Houston Post*, 1965, 22.
38. Memorandum, "Telecon from NASA, Office of Manned Space Flight, 10/14/66," Olin E. Teague Papers, Texas A&M University Archives, Box 222.
39. George E. Mueller, Associate Administrator for Manned Space Flight, to Olin E. Teague, Chairman, Subcommittee on Manned Space Flight, October 19, 1965, Teague Papers, Box 222.
40. Olin E. Teague, Washington, D.C. to William P. Hobby, Jr., Houston, Texas, November 10, 1966, Teague Papers, Box 222.
41. Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 190-193.
42. Interview, Merrifield with Gilruth, 1969.
43. *The Kennedy Space Center Story* (Kennedy Space Center, Florida: NASA, John F. Kennedy Space Center, 1974), iii, 47-48.

44. *The KSC Story*, 1974, 49-52, 63; Brooks, Grimwood, Swenson, 1979, 50-51; Interview, Swenson and Grimwood with Kleinknecht, 1970.
45. Brooks, Grimwood, and Swenson, 1979, 192-195; *The KSC Story*, 1974, 51.
46. Brooks, Grimwood, and Swenson, 1979, 208-212.
47. Brooks, Grimwood, and Swenson, 1979, 213-218.
48. Brooks, Grimwood, and Swenson, 1979, 218-222.
49. Brooks, Grimwood, and Swenson, 1979, 222-233.
50. Memorandum, "Mr. Teague . . .," undated, Olin E. Teague Papers, Committee on Science and Astronautics, Texas A&M University Archives, Box 320.
51. Interview, Merrifield with Low, 1969.
52. Brooks, Grimwood, and Swenson, 1979, 223-230.
53. Interview, Dethloff with Bond, 1989; Interview, Henry C. Dethloff with Aleck Bond, February 1, 1990.
54. Interview, Dethloff with Bond, 1989 and 1990.

Chapter 7

1. Michael Collins, *Carrying the Fire, An Astronaut's Journeys* (New York: Farrar, Straus & Giroux, 1974), Reprinted by New York: Bantam Books, 1983, 274.
2. Collins, 1974, 407.
3. Linda Neuman Ezell, *NASA Historical Data Book, III, Programs and Projects 1969-1978*, NASA SP-4012 (Washington: 1988), 9, 61; Jane Van Nimmen and Leonard C. Bruno, with Robert L. Rosholt, *NASA Historical Data Book, I, NASA Resources 1958-1968* (Washington: 1988), 118.
4. D.H. Beyer and S.B. Sells, "Selection and Training of Personnel for Space Flight" (February 1957), 1-6, Flight Crew Operations Subseries, JSC History Office.
5. Beyer and Sells, 1957, 1-6.
6. Beyer and Sells, 1957, 1-6.
7. Beyer and Sells, 1957, 1-6.
8. John A. Pitts, *The Human Factor: Biomedicine in the Manned Space Program to 1980*, NASA SP-4213 (Washington, D.C.: 1985), 15-18; Jerry Bledsoe, "Down from Glory," *Esquire* (January 1973:83-86).
9. Charles A. Berry, M.D. "Biographical Data," Biographical Data Subseries, JSC History Office.
10. Pitts, 1985, 2.
11. *Astronauts and Cosmonauts, Biographical and Statistical Data* (Revised June 28, 1985), Prepared by the Congressional Research Service, Library of Congress for the Committee on Science and Technology, U.S. House of Representatives, 99th Cong., 1st Sess. (Washington: Government Printing Office, December 1985), 9; *First Semiannual Report to the Congress of the National Aeronautics and Space Administration*, House Doc. No. 187, 86th Cong., 1st Sess. (Washington: Government Printing Office, 1959), 10-11, 68; Robert B. Merrifield, "Men and Spacecraft: A History of the Manned Spacecraft Center, 1958-1969," unpublished mss., 2-29 to 2-33, JSC History Office; Memorandum, W. Randolph Lovelace II, A.H. Schwichtenberg, and Ulrich C. Luft, Selection Program for Astronauts for the National Aeronautics and Space Administration (November 5, 1959), 1-9 and attachments, Flight Crew Operations Subseries, JSC History Office.
12. *First Semiannual Report to the Congress*, 1959, 11.
13. *First Semiannual Report to the Congress*, 1959, 11; Interview, Henry C. Dethloff with Charles J. Donlan, Alexandria, Virginia, January 17, 1990. Note: NASA Press Release No. 59-113 from Bob Voas

dated April 9, 1959, indicates that 69 persons were interviewed rather than 63; and of these, 32 made the selection to a semifinal list.

14. *Astronauts and Cosmonauts*, 1985, 20; Interview, Henry C. Dethloff with Donald K. Slayton, JSC, Houston, Texas, December 5, 1989.
15. *Astronauts and Cosmonauts*, 1985, 20; Interview, Dethloff with Slayton, 1989; Collins, 1974, 27-28.
16. Collins, 1974, 27-28; Interview, Dethloff with Slayton, 1989.
17. Interview, Dethloff with Donlan, 1990; Memorandum, Press Conference, Mercury Astronaut Team, 9 April 1959, Vertical Files, JSC History Office.
18. Interview, Dethloff with Slayton, 1989; Interview, Robert B. Merrifield with John H. Glenn, Jr., Houston, Texas, March 15, 1968, Oral History Series, JSC History Office.
19. Interview, Robert B. Merrifield with John A. Powers, November 11, 1968, Oral History Series, JSC History Office.
20. Interview, Merrifield with Glenn, 1968.
21. Interview, Merrifield with Glenn, 1968; Interview, Merrifield with Powers, 1968.
22. Interview, Merrifield with Glenn, 1968.
23. Interview, Merrifield with Glenn, 1968.
24. Robert R. Gilruth to George E. Mueller, November 18, 1963, Flight Crew Operations Subseries, JSC History Office.
25. Memorandum from the Assistant Administrator for Public Affairs to Public Affairs Officer, MSC [1961]; Memorandum for Dr. Bundy (from Jerome B. Wiesner), The White House, March 9, 1961, Flight Crew Operations Subseries, JSC History Office.
26. Interview, Robert B. Merrifield with Paul G. Dembling, September 25, 1969, Oral History Series, JSC History Office.
27. Interview, Merrifield with Powers, 1968.
28. Interview, Merrifield with Dembling, 1969.
29. Interview, Merrifield with Powers, 1968.
30. Interview, Dethloff with Slayton, 1989; Interview, Merrifield with Glenn, 1968.
31. Interview, Merrifield with Glenn, 1968
32. Memorandum, Robert B. Voas, Human Factors Branch, "Outline of the NASA Astronaut Training Program," with appendices, typed May 5, 1959, Flight Crew Operations Subseries, JSC History Office.
33. Memorandum, Voas, 1959.
34. Memorandum, Voas, 1959.
35. Memorandum, Voas, 1959; Robert B. Voas, Harold I. Johnson, and Raymond Zedeker, *Mercury Project Summary Including Results of the Fourth Manned Orbital Flight, May 15 and 16, 1963*, NASA SP-45 (Houston: 1963), 171-197.
36. Voas, Johnson, Zedeker, 1963, 171, 173.
37. Interview, Dethloff with Slayton, 1989.
38. Interview, Robert B. Merrifield with Edwin E. Aldrin, July 7, 1970, Oral History Series, JSC History Office.
39. Interview, Merrifield with Aldrin, 1970.
40. Interview, Merrifield with Aldrin, 1970; Interview, Robert B. Merrifield with Donald K. Slayton, October 17, 1967; Interview, Dethloff with Slayton, 1989; Interview, Robert B. Merrifield with Warren J. North, May 1, 1970, 9-10, Oral History Series, JSC History Office.

41. *Astronauts and Cosmonauts*, 1985, 9.
42. *Astronauts and Cosmonauts*, 1985, 9-10.
43. Memorandum, Plan for Integrating Scientists Into Flight Crews of Apollo Lunar Landing Missions, March 13, 1964, Apollo Series, JSC History Office.
44. Memorandum, Plan for Integrating Scientists; *Astronauts and Cosmonauts*, 1985, 10.
45. *Astronauts and Cosmonauts*, 1985, 10-11.
46. *Astronauts and Cosmonauts*, 1985, 10-11.
47. Aleck C. Bond, "A Review of Man-Rating in Past and Current Manned Space Flight Programs," Eagle Engineering/LEMSCO Report No. 88-193, May 20, 1988; Vertical Files, JSC History Office.
48. Bond, 1988, 5.
49. Bond, 1988, 7.
50. Bond, 1988, 4-27.
51. *Major Test Facilities of the Engineering and Development Directorate* (Houston: April 1966), 2-1 to 2-26, Engineering Subseries, JSC History Office.
52. *Major Test Facilities*, 1966, 2-1 to 2-26.
53. *Major Test Facilities*, 1966, 2-1 to 2-26.
54. *Major Test Facilities*, 1966, 7-16 to 7-41; Memorandum, Aleck C. Bond to Henry C. Dethloff, April 24, 1991.
55. Memorandum, Bond, 1991, and see Henry S.F. Cooper, Jr., *Before Liftoff: The Making of a Space Shuttle Crew* (Baltimore: Johns Hopkins University Press, 1987), X, 16, 32-33.
56. Interview, Robert B. Merrifield with Julian Scheer, July 20, 1967.
57. Interview, Merrifield with Scheer, 1967.
58. Interview, Merrifield with Scheer, 1967; Interview, Merrifield with Aldrin, 1970.
59. Interview, Henry C. Dethloff with Eugene Horton, February 15, 1989; Eugene Horton, personal papers and scrapbooks.
60. Courtney G. Brooks, James M. Grimwood, Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 232-234.
61. MSC Announcement 67-183, December 14, 1967, General Reference Series, JSC History Office.
62. Brooks, Grimwood, and Swenson, 1979, 241-244.
63. Brooks, Grimwood, and Swenson, 1979, 247-250.
64. Brooks, Grimwood, and Swenson, 1979, 250.

Chapter 8

1. Arnold S. Levine, *Managing NASA in the Apollo Era*, NASA SP-4205 (Washington, D.C.: 1982), 68-70.
2. Levine, 1982, 68-70.
3. Memorandum signed by W.F. Rockwell, Jr., accompanying distribution of Beirne Lay, Jr., *Earthbound Astronauts: The Builders of Apollo-Saturn* (Englewood Cliffs, N.J.: Prentice-Hall, 1971); U.S. Manned Space Flight, The Manned Flight Program, The Astronauts (NASA memorandum), n.p., n.d. [1971], 0-32, Vertical Files, JSC History Office.
4. Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 88-90; Lay, 1971, 33; Ralph B.

- Oakley, "Historical Summary, S & ID Apollo Program," North American Aviation, Inc., January 20, 1966, 1-50, in "Apollo Execs, January 27-28, 1967," NASA History Office, Washington, D.C., Drawer 15-3; Interview, Ivan D. Ertel with John W. Paup, June 7, 1966, Oral History Series, JSC History Office.
5. Interview, Ertel with Paup, 1966.
 6. Interview, Ertel with Paup, 1966.
 7. John Yardley, "McDonnell/Spacecraft," in "Apollo Execs, January 27-28, 1967," NASA History Office, Drawer 15-3.
 8. Lyndon Baines Johnson, *The Vantage Point: Perspectives of the Presidency, 1963-1969* (New York: Holt, Rinehart and Winston, 1971), 270-271; Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 213-218; Memorandum, Robert C. Seamans, Jr. to George Mueller, November 21, 1966, in "Apollo Execs, January 27-28, 1967," NASA History Office, Drawer 15-3.
 9. Yardley, 1967, Drawer 15-3.
 10. Yardley, 1967, Drawer 15-3.
 11. Interview, Ertel with Paup, 1966.
 12. Interview, Ertel with Paup, 1966.
 13. Interview, Ertel with Paup, 1966.
 14. Documents in the History of NASA, An Anthology (Preliminary Edition), NASA History Office, Washington, D.C., June 1975, 149-51.
 15. Documents in the History of NASA, An Anthology, 1975, 152-163.
 16. Documents in the History of NASA, An Anthology, 1975, 149-151.
 17. Interview, Ertel with Paup, 1966.
 18. Oakley, 1966, 1-50.
 19. Oakley, 1966, 1-50.
 20. NASA News Releases, 89-97, 89-98, July 7, 1989, Langley Research Center.
 21. NASA News Releases, 89-97, 89-98; Chris Kraft to Henry Dethloff, Comments on draft of Chapter 8.
 22. Kraft to Dethloff on Chapter 8; Interview, Ertel with Paup, 1966, Oral History Series, JSC History Office.
 23. Oakley, 1966, 21-23; and see Paul Purser to Henry Dethloff, Comments on draft of Chapter 8, March 14, 1990.
 24. Oakley, 1966, 1-50.
 25. Oakley, 1966, 1-50.
 26. Olin E. Teague Papers, Texas A&M University Archives, Boxes 222, 223, 224.
 27. Memorandum, "Mr. Teague from Pete G.," undated, Olin E. Teague Papers, Texas A&M University Archives, Box 222.
 28. Memorandum, Teague Papers, undated, Box 222.
 29. "Space" Billions - Now a Boom? *U.S. News and World Report* (July 20, 1964):8-12; Sylvia Doughty Fries, Evolution of the NASA Institution, Langley Research Center, January 17, 1990, unpublished paper.
 30. Oakley, 1966, 3-12, 35-38.
 31. Oakley, 1966, 3-12, 35-38, 13; *Historical Statistics of the United States, Colonial Times to 1970*, Part 2 (Washington, D.C.: Bureau of the Census, 1975), Series Y 457-465, 472-487, and 1114-16.
 32. Oakley, 1966, 12-13; and see Fries, Evolution of the NASA Institution.

33. Linda Neuman Ezell, *NASA Historical Data Book*, II (Washington, D.C.: NASA, 1988), 192-194.
34. Ezell, 1988, 192-194.
35. Ezell, 1988, 192-194.
36. Oakley, 1966, 21-29.
37. William David Compton, *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions*, NASA SP-4214 (Washington, D.C.: 1989), 41-54.
38. Compton, 1989, 41-54.
39. Compton, 1989, 41-54.
40. Compton, 1989, 41-54.
41. Compton, 1989, 387-388; U.S. Manned Space Flight memorandum, Program, 1971, 9-11.
42. U.S. Manned Space Flight memorandum, 1971, 9-11.
43. Committee on Science and Technology, U.S. House of Representatives, *Astronauts and Cosmonauts: Biographical and Statistical Data* [Revised - June 28, 1985], Ninety-Ninth Congress (Washington, D.C.: Government Printing Office, 1985), 58, 61, 131.
44. "Returns from the Space Dollar," address by Edward C. Welsh, October 11, 1966, in Olin E. Teague Papers, Texas A&M University Archives, Box 222.
45. Address by Welsh, 1966, Box 222.
46. Address by Welsh, 1966, Box 222.

Chapter 9

1. Interview, Henry C. Dethloff with N. Wayne Hale, Jr., October 19, 1989, Mission Control, JSC, Houston, Texas.
2. *Encyclopedia Britannica*, Eleventh Edition (Cambridge, England: The University Press, 1910), 184-186; Michael Collins, *Liftoff: The Story of America's Adventure in Space* (New York: Grove Press, 1988), 8.
3. Linda Neuman Ezell, *NASA Historical Data Book*, III, *Programs and Projects 1969-1978*, NASA SP-4012 (Washington, D.C.: 1988), 73-92.
4. Maxime A. Faget, "An Overview of United States Manned Space Flight From Mercury to the Shuttle," Preprint for distribution to the XXXII Congress, International Astronautical Federation, Rome, Italy, September 6-12, 1981, in Faget Subseries, JSC History Office.
5. Faget, 1981.
6. Interview, Henry C. Dethloff with Eugene F. Kranz, March 6, 1990, Houston, Texas, Oral History Series, JSC History Office.
7. John Hodge, Comments on preliminary draft of Chapter 9, undated.
8. Interview, Dethloff with Kranz, 1990.
9. Interview, Dethloff with Kranz, 1990.
10. Interview, Dethloff with Kranz, 1990.
11. Interview, Dethloff with Kranz, 1990; Hodge comments on Chapter 9.
12. Hodge comments on Chapter 9; Faget, 1981, 7.
13. Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4205 (Washington, D.C.: 1979), 387-393.
14. *Space News Roundup* (December 16, 1988).

15. Brooks, Grimwood, and Swenson, 1979, 256-260; Frank Borman, Apollo 20th Anniversary Celebration Speaker's Series, "The Moon as Seen by Apollo Astronauts," July 21, 1989, Vertical Files, JSC History Office.
16. Brooks, Grimwood and Swenson, 1979, 256-260.
17. Brooks, Grimwood and Swenson, 1979, 256-260.
18. Brooks, Grimwood and Swenson, 1979, 272-274.
19. Brooks, Grimwood and Swenson, 1979, 273; Clifford E. Charlesworth and Glynn Lunney, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC; Ron Berry, Apollo 20th Anniversary Celebration Speaker's Series, "Planning the Apollo Missions" (not transcribed), July 18, 1989, JSC.
20. Berry, 1989; Oran W. Nicks, *Far Travelers: The Exploring Machines* (Washington, D.C.: NASA, 1985), 93-94; and Oran W. Nicks, Comments on preliminary draft of Chapter 9, April 7, 1990.
21. Interview, Dethloff with Kranz, 1990; Gerald D. Griffin, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989.
22. Charlesworth, 1989.
23. Charlesworth, 1989; Chris Kraft, Comments on preliminary draft of Chapter 9, undated.
24. Owen Morris, Comments on preliminary draft of Chapter 9, undated.
25. Interview, Dethloff with Kranz, 1990.
26. Interview, Dethloff with Kranz, 1990.
27. Brooks, Grimwood and Swenson, 1979, 98-113, 175-178; Project Apollo, Lunar Excursion Module Development Statement of Work, June 18, 1962, Apollo Series, JSC History Office.
28. Thomas J. Kelly, "Apollo Lunar Module Mission and Development Status," AIAA 4th Annual Meeting and Technical Display, Anaheim, California, October 23-27, 1967, Vertical Files, JSC History Office, 1-11.
29. Kelly, 1967; Thomas J. Kelly, "Technical Development Status of the Project Apollo Lunar Excursion Module" [AAS 10th Annual Meeting, May 4-7, 1964], Vertical Files, JSC History Office, 1-63.
30. MSC Announcements: 67-33, February 20, 1967; 67-34, February 23, 1967; 67-63, April 27, 1967, General Reference Series, JSC History Office.
31. Faget, 1981, 9; Brooks, Grimwood and Swenson, 1979, 178-179.
32. Eugene A. Cernan, Apollo 20th Anniversary Celebration Speaker's Series, "The Moon as Seen by Apollo Astronauts," July 21, 1989, Vertical Files, JSC History Office.
33. Michael Collins, Apollo 20th Anniversary Celebration Speaker's Series, "The Moon as Seen by Apollo Astronauts," July 21, 1989, Vertical Files, JSC History Office.
34. Interview, Dethloff with Kranz, 1990.
35. Steve Bales, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC History Office.
36. Bales, 1989; Interview, Dethloff with Kranz, 1990.
37. Interview, Dethloff with Kranz, 1990.
38. Charlesworth, 1989.
39. Charlesworth and Lunney, 1989.
40. Collins, 1989.
41. Address by William B. Bergen (undated) in Eugene E. Horton, personal files.

42. Gerald Griffin and Glynn Lunney, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC.
43. Griffin and Lunney, 1989; Ezell, 1988, 86.
44. Joseph P. Allen, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC History Office.
45. MSC Announcement 67-7, January 10, 1967, General Reference Series, JSC History Office.
46. MSC Announcement 67-7, 67-4, January 13, 1967, General Reference Series, JSC History Office.
47. MSC Announcement 67-27, February 17, 1967, General Reference Series, JSC History Office.
48. Griffin and Allen, Apollo 20th Anniversary Celebration Speaker's Series, "Flying the Apollo Missions" (not transcribed), July 19, 1989, JSC History Office.
49. Interview, Dethloff with Kranz, 1990.
50. Interview, Dethloff with Hale, 1989.
51. James A. Lovell, Jr., Apollo 20th Anniversary Celebration Speaker's Series, "The Moon as Seen by Apollo Astronauts," July 21, 1989, Vertical Files, JSC History Office.
52. Interview, Dethloff with Kranz, 1990.
53. Interview, Dethloff with Kranz, 1990.
54. William David Compton, *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions*, NASA SP-4214 (Washington, D.C.: 1989), 388, and see 386-393.
55. Interview, Dethloff with Kranz, 1990.
56. Interview, Dethloff with Kranz, 1990.

Chapter 10

1. "The Case for Space," Reprint of an Interview with Olin E. Teague published in North American Rockwell's *Skyline Magazine*, in Olin E. Teague Papers, Texas A&M University Archives, Box 224.
2. Courtney G. Brooks, James M. Grimwood, Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft*, NASA SP-4214 (Washington, D.C.: 1979), 7-9.
3. Roland W. Newkirk and Ivan D. Ertel, with Courtney G. Brooks, *Skylab: A Chronology*, NASA SP-4011 (Washington, D.C.: 1977), 8-22.
4. Newkirk, Ertel, and Brooks, 1977, 8-22; E.H.Olling, Memorandum for the Office of the Director, Attn: Mr. Paul Purser, July 24, 1962, Post-Apollo Planning Subseries, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas.
5. Olling Memo, 1962; Michael Getler, "Goodyear Shows New Inflatable Station," *Missiles and Rockets* (August 13, 1962), 24; Charles W. Mathews, Memorandum for Walter C. Williams, Associate Director (MSC), Houston, Texas, October 29, 1962 and J. Mockovciak, Jr., Grumman Aircraft Engineering Corporation (PDM-330-6) to Distribution, November 14, 1962, Post-Apollo Planning Subseries, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas; Sylvia D. Fries, Space Station: Evolution of A Concept, NASA Headquarters History Division, February 29, 1984, 1-13, appendices.
6. Newkirk, Ertel, and Brooks, 1977, 23-38.
7. Olin E. Teague Papers, Committee on Science and Astronautics, February 3, 1965-April 20, 1965, Texas A&M University Archives, Box 370; Post-Apollo Planning Subseries, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas.
8. U.S. Congress, 89th Cong., 1st Sess., Hearings Before the Committee on Aeronautical and Space Sciences, United States Senate, August 23, 24, and 25, 1965, 47-104; W. David Compton and Charles D. Benson,

- Living and Working in Space: A History of Skylab*, NASA SP-4208 (Washington, D.C.: 1983), 26-27.
9. Compton and Benson, 1983, 26.
 10. Olin E. Teague to George E. Mueller, May 24, 1966, Apollo Series, JSC History Office; Arnold S. Levine, *Managing NASA in the Apollo Era*, NASA SP-4102 (Washington, D.C.: 1982), p. 189.
 11. "Bold Decisions on Space Asked," *New York Times* (August 10, 1966).
 12. P.A. Gerardi to Mr. Teague, October 6, 1966, Olin E. Teague Papers, Science and Astronautics, Texas A&M University Archives, Box 370.
 13. Thomas G. Miller, Jr., *The National Space Program: Problems and Promise* (New York]: Arthur D. Little, Inc., September 1966), 1-31, Copy in Olin E. Teague Papers, under cover of letter from Miller to Teague, November 11, 1966, Texas A&M University Archives, Box 223.
 14. Robert R. Gilruth to George E. Mueller, "Apollo Applications Program Approach to Future Manned Spaceflight," March 25, 1966, Shuttle Series, JSC History Office.
 15. Walter G. Hall, Dickinson, Texas, to Olin E. Teague, January 16, 1967; Teague to Hall, January 24, 1967, in Olin E. Teague Papers, Texas A&M University Archives, Box 369.
 16. "After Apollo, What Next?" Remarks by J.P. Rogan before the Washington, D.C., chapters of the American Institute of Aeronautics and Astronautics and the American Astronautical Society, January 5, 1967.
 17. A Report of the President's Science Advisory Committee, *The Space Program in the Post-Apollo Period* (Washington, D.C.: The White House, February 1967), 1-99.
 18. Levine, 1982, 185-204.
 19. Levine, 1982, 187-188, 207-209, 233-234.
 20. Position Paper for FY 1971 Budget Hearings, AAP Schedule Slippages, February 6, 1970, and (Draft) Post-Apollo Advisory Group Summary of Proceedings, July 25, 1968, Post-Apollo Planning Subseries, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas.
 21. Memorandum, Proposed Center Intentions on Institutional Planning for the Manned Spacecraft Center, by Paul E. Purser, July 22, 1968, Vertical Files, JSC History Office.
 22. Letter, George Mueller to Kurt Debus, "Proposed Goals in Manned Space Flight and NASA in the Next Decade," September 26, 1969, Apollo Series, JSC History Office.
 23. Space Task Group Report to the President, *The Post-Apollo Space Program: Directions for the Future* (September 1969), 1-37; Memorandum, Activities of President's Space Task Group and NASA Internal Planning Groups, April 1, 1969, Post-Apollo Planning Subseries, JSC History Archive, Woodson Research Center, Rice University, Houston, Texas; *America's Next Decades in Space, A Report for the Space Task Group* (NASA, September 1969), 1-87.
 24. Position Paper for FY 1971 Budget Hearings, JSC History Archive, Rice University.
 25. Robert F. Freitag to Distribution, April 29, 1970, with enclosure letters from respondents dated April 10 through 22, 1970, Apollo Series, JSC History Office.
 26. (Typescript) E.M. Emme, *Preliminary History of NASA, II, Supplement, October 1968 - January 1969*, Washington, D.C., NASA, January 15, 1969, I-1 to V-25.
 27. Interview, Henry C. Dethloff with Gerald D. Griffin, Houston, Texas, April 16, 1990.
 28. Interview, Henry C. Dethloff with Aleck C. Bond, September 21, 1989.
 29. Interview, Dethloff with Bond, 1989.
 30. Interview, Dethloff with Bond, 1989.
 31. Interview, Dethloff with Bond, 1989.
 32. Jerry Bledsoe, "Down From Glory," *Esquire* (January 1973), 83-86, 94, 176-190; *Astronauts and*

- Cosmonauts, Biographical and Statistical Data* [Revised June 28, 1985], Congressional Research Services, Library of Congress (Washington, D.C.: Government Printing Office, 1985), 139.
33. *Astronauts and Cosmonauts*, 1985, 114, 129.
 34. *Apollo Program Summary Report* (Houston: NASA, JSC, April 1975), 2-41 to 2-45.
 35. *Apollo Program Summary Report*, 1975, 2-45 to 2-48.
 36. Press Release, July 18, 1972, "Aspin Blasts Apollo 15 Astronaut's Scheme"; Memorandum, Apollo 15 Crew Visit to the Capitol, September 9, 1971, Olin E. Teague Papers, Miscellaneous, Texas A&M University Archives, Box 224.
 37. (Typescript) CBS News with John Hart, October 6, 1972, Olin E. Teague Papers, Miscellaneous, Texas A&M University Archives, Box 224.
 38. *Astronauts and Cosmonauts*, 1985, 94, 135, 163.
 39. *Apollo Program Summary Report*, 1975, 2-48 to 2-51, 3-1 to 3-105.
 40. *Apollo Program Summary Report*, 1975, 2-48 to 2-51, 3-1 to 3-105.
 41. Memorandum, Chief, Public Appearances Branch to Assistant Administrator for Public Affairs, "Apollo 17 Postflight," April 6, 1973, Flight Crew Operations Subseries, JSC History Office.
 42. Olin E. Teague, "What Apollo 16 Mission Means," *Congressional Record*, 91st Cong., May 16, 1972, E5269.
 43. Letters to Frank A. Bogart, re: JSC Organization Review, from Kenneth S. Kleinknecht (April 25, 1972), John Eggleston (April 27, 1972), C.E. Charlesworth (April 25, 1972), Joseph V. Piland (n.d.), Philip H. Whitbeck (May 9, 1972), Donald K. Slayton (n.d.), Bill Tindall (n.d.), and memorandum from Frank A. Bogart and George Low, in Loftus Subseries, JSC History Office.
 44. Letters to Frank A. Bogart, 1972.

Chapter 11

1. "A Message from MSC Director Dr. Robert R. Gilruth," *Space News Roundup* (hereafter cited *Roundup*) (December 18, 1970).
2. Organizational Study, MSC (n.d.), Loftus Subseries, JSC History Office; Linda Neuman Ezell, *NASA Historical Data Book, III, Programs and Projects, 1969-1978*, NASA SP-4012 (Washington, D.C.: 1988), 93-113.
3. JSC Organization Review, 1972, Loftus Subseries, JSC History Office; and see R. Wayne Young, *The Utilization of Project Management Concepts at the NASA Johnson Space Center*, unpublished dissertation, University of Colorado, 1983, 284-295.
4. *Roundup* (January 21, 1972).
5. W. David Compton and Charles D. Benson, *Living and Working in Space: A History of Skylab*, NASA SP-4208 (Washington, D.C.: 1983), 19-112.
6. Compton and Benson, 1983, 29, 110.
7. Compton and Benson, 1983, 133ff.; Ezell, 1988, 100-103.
8. MSC Announcement 71-77, May 18, 1971, General Reference Series, JSC History Office.
9. Interview, Henry C. Dethloff with William R. Kelly, JSC, May 9, 1990; MSC Announcement 72-11, January 21, 1972, General Reference Series, JSC History Office.
10. Interview, Dethloff with Kelly, 1990.
11. MSC Announcement 72-26, February 22, 1972.

12. *Roundup* (February 2, 1973) and (August 17, 1973).
13. Compton and Benson, 1983, 119ff.; Ezell, 1988, 101-108; *Roundup* (May 25, June 8, 22, July 20, 1973).
14. *Roundup* (July 6, 20, August 3, September 14, September 28, October 12, 1973).
15. *Roundup* (October 12, 1973, January 4, February 15, 1974).
16. JSC Organization Review, 1972, Loftus Subseries, JSC History Office.
17. JSC Organization Review, 1972, Loftus Subseries, JSC History Office.
18. MSC Announcement 71-21, February 16, 1971, General Reference Series, JSC History Office.
19. MSC Announcement 71-23, February 16, 1971, General Reference Series, JSC History Office.
20. MSC Announcement 72-25, February 18, 1972, General Reference Series, JSC History Office.
21. MSC Announcements: 67-27, February 17, 1967, 67-4, January 13, 1967, 67-7, January 10, 1967, General Reference Series, JSC History Office; and see William David Compton, *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions*, NASA SP-4214 (Washington, D.C.: 1989), 54, 73-90.
22. MSC Announcement 71-54, April 15, 1971, General Reference Series, JSC History Office.
23. MSC Announcement 72-10, January 20, 1972, General Reference Series, JSC History Office.
24. MSC Announcement 71-65, May 5, 1971, General Reference Series, JSC History Office.
25. George Low, Acting Administrator, Memorandum, International Participation in the Post-Apollo program," to Distribution, November 2, 1970, Apollo Series, JSC History Office; Walter Froehlich, *Apollo Soyuz*, EP-109 (Washington, D.C.: 1976), 29-36.
26. Froelich, 1976, 29-36; *Roundup*, (December 3, 1971; January 7, May 26, June 9, 1972).
27. Maxime A. Faget, Background and Planning for the Apollo/Soyuz Mission, August 26-31, 1974, Max Faget Subseries, JSC History Office, 1-21.
28. *Roundup* (October 13, 1972); MSC personnel accompanying him included Hugh Scott, Clarke Covington, M.P. Frank, Thomas P. Stafford, Robert Ward, Edgar C. Lineberry, Donald C. Wade, Robert White, William Creasy, Lawrence Williams, C.C. Johnson, John Schliesing, R.E. Smylie, W.W. Guy, Dr. W.R. Hawkins, Raymond Zedeker and H.E. Smith; Ezell, *NASA Historical Data Book*, III, *Programs and Projects, 1969-1978*, 108-112.
29. Ezell, 1988, 108-112; Faget, 1974; Froelich, 1976, 7-14.
30. Ezell, 1988, 108-112.
31. *Roundup* (August 15, 1975).
32. Memorandum, Max Akridge (PD-RV), Space Shuttle History, January 8, 1970, MSFC Reports Subseries, JSC History Office.
33. Akridge, Space Shuttle History.
34. Akridge, Space Shuttle History; and see Eagle Engineering, Inc., Report No. 86-125C, Technology Influence on the Space Shuttle Development, June 8, 1986, MSC/JSC Subseries, JSC History Office.
35. Akridge, Space Shuttle History, 25.
36. Akridge, Space Shuttle History, 26-35.
37. Akridge, Space Shuttle History, 36.
38. Akridge, Space Shuttle History, 36-46.
39. Akridge, Space Shuttle History, 46-47.
40. Akridge, Space Shuttle History, 47-48.

41. Akridge, Space Shuttle History, 49; Ezell, 1988, 113-118.
42. Akridge, Space Shuttle History, 58-60.
43. Akridge, Space Shuttle History, 62-65; Interview, Henry C. Dethloff with John Hodge, Falls Church, Virginia, January 15, 1990.
44. Akridge, Space Shuttle History, 62-65.
45. Akridge, Space Shuttle History, 62-65.
46. Akridge, Space Shuttle History, 68-98.
47. Ezell, 1988, 127-362.
48. NASA News Release 70-4, January 8, 1970.
49. NASA News Release 70-4, January 8, 1970; Interview, Ivan Ertel and Ralph Oakley with Dale D. Myers, Downey, California, May 12, 1969, Oral History Series, JSC History Office.
50. Interview, Henry C. Dethloff with Charles J. Donlan, Alexandria, Virginia, January 17, 1990, Oral History Series, JSC History Office.
51. Memorandum from Joseph Loftus in response to an inquiry from Aaron Cohen [1990], "How did we manage integration in the Apollo and Shuttle Programs?" Loftus personal files.
52. *Roundup* (June 18, 1971); Dale D. Myers, "Space Shuttle Program Management," March 14, 1972, NASA Management Instruction Subseries, JSC History Office.
53. Memorandum, Loftus to Cohen (1990).
54. *Roundup* (June 18, 1971) and (January 21, 1972).
55. Roger E. Bilstein, *Orders of Magnitude: A History of the NACA and NASA, 1915-1990*, NASA SP-4406 (Washington, D.C.: 1989).
56. George Low, "Meeting with the President on January 5, 1972," memo for the record, January 12, 1972, Shuttle Series, JSC History Office.
57. *Roundup* (January 21, 1972).
58. MSC Announcement 71-21, February 16, 1971, General Reference Series, JSC History Office.
59. Ezell, 1988, 113-124.
60. *Roundup* (January 4, 1974).

Chapter 12

1. John F. Guilmartin (Management Analysis Office Administration Directorate), *A Shuttle Chronology, 1964-1973: Abstract Concepts to Letter Contracts* (Houston: NASA, JSC, December 1988), VII-3, 16, 48, 52 (hereafter cited *A Shuttle Chronology*, 1988); Interview, Henry C. Dethloff with Henry O. Pohl, JSC, May 9, 1990.
2. Myers to Distribution, FY 1974 Budget Program Guidelines, August 17, 1972, Shuttle Series, JSC History Office; *A Shuttle Chronology*, 1988, VII-3, 16, 48, 52; Interview, Dethloff with Pohl, 1990.
3. *Catalog of Center Roles* (Washington, D.C.: NASA, December 1976), 1-30, Loftus Subseries, JSC History Office.
4. *Catalog of Center Roles*, 1976, 1-30; *A Shuttle Chronology*, 1988, VI-43.
5. Robert F. Thompson, Biographical Data Subseries, JSC History Office.
6. *Catalog of Center Roles*, 1976, 1-30.
7. *Catalog of Center Roles*, 1976, 1-30.

Suddenly Tomorrow Came . . .

8. Aaron Cohen, Biographical Data Subseries, JSC History Office.
9. JSC Announcement 73-24, February 15, 1973, and 73-53 and 73-54, March 27, 1973, General Reference Series, JSC History Office.
10. *Space News Roundup* (hereafter cited *Roundup*) (April 19, 1991).
11. *A Shuttle Chronology*, 1988, VII-3.
12. Clippings and memoranda, January 6-9, 1972, Shuttle Series, JSC History Office.
13. *A Shuttle Chronology*, 1988, see particularly Chapters V, VI-10-11, and VI-40: The suborbital staging plan is attributed to Jack Funk, John T. McNeely, Burl G. Kirkland, Stewart F. McAdoo, Jr., and Victor R. Bond of the Advanced Mission Design Branch, Mission Planning and Analysis Division of JSC. See "Development of Suborbital Staging for the Shuttle External Propellant Tank," Loftus History Committee Subseries, JSC History Office.
14. *A Shuttle Chronology*, 1988, VII-3 to 4, VII-48.
15. *A Shuttle Chronology*, 1988, VII-98 to 99.
16. *Roundup* (March 1, 1974).
17. Eleanor H. Ritchie, *Astronautics and Aeronautics, 1977* (Washington, D.C.: NASA, 1986), 52-93.
18. Interview, Henry C. Dethloff with Christopher C. Kraft, Houston, Texas, March 6, 1990.
19. Interview, Dethloff with Kraft, 1990.
20. *A Shuttle Chronology*, 1988, VII:61-62.
21. Robert F. Thompson, The Space Shuttle - Some Key Program Decisions, 1984 Von Karman Lecture, Houston, Texas, Vertical Files, JSC History Office; Aaron Cohen, Progress of Manned Space Flight from Apollo to Space Shuttle, AIAA 22nd Aerospace Sciences Meeting, January 9-12, 1984, Reno, Nevada (NY: American Institute of Aeronautics and Astronautics).
22. Thompson, 1984; Cohen, 1984.
23. *A Shuttle Chronology*, 1988, I:6-9.
24. *Major Test Accomplishments of the Engineering and Development Directorate* (Houston: MSC, April 1966), sections 1-8, Engineering Subseries, JSC History Office.
25. Henry O. Pohl, Biographical Data Subseries, JSC History Office.
26. Henry O. Pohl, 1:1-23.
27. Henry O. Pohl, 2:1-26.
28. Henry O. Pohl, 3:3-10; NASA Information Summary, *Computers*, PMS-016 (JSC), May 1987, 1-8.
29. NASA Information Summary, 1-8.
30. Charles Olasky, Shuttle Mission Simulator, in Proceedings of the 11th Space Simulation Conference, JSC, September 23-25, 1980 (Washington, D.C.: NASA, 1980).
31. Kathy Colgan, "Astronaut Selection and Training," June 18, 1982, 1-10, Flight Crew Operations Subseries, JSC History Office.
32. Henry S.F. Cooper, *Before Lift-Off: The Making of a Space Shuttle Crew* (Baltimore: Johns Hopkins Press, 1987), 33.
33. *Astronauts and Cosmonauts, Biographical and Statistical Data* (Washington, D.C.: Government Printing Office, December 1985).
34. Colgan, 1982; C.H. Woodling to Distribution, Shuttle Crew Training, June 8, 1973, Flight Crew Operations Subseries, JSC History Office.
35. Colgan, 1982.

36. *Roundup* (December 12, 1962), (June 10, 1964), (October 14, 1964), (September 1, 1989), and (September 22, 1989).
37. *Roundup*, 1962, 1964, 1989.
38. Colgan, 1982.
39. *Roundup* (April 9, 1971).
40. William David Compton, "NASA and the Space Sciences," *Science and Technology in Texas*, 122-134.
41. Harrison Schmitt, "The Moon Before Apollo" (not transcribed), Apollo 20th Anniversary Celebration Speaker's Series, July 17, 1989, JSC History Office.
42. John Wood, "What Did We Learn and Where Did it Lead?," Apollo 20th Anniversary Celebration Speaker's Series, July 20, 1989, Vertical Files, JSC History Office.
43. See William David Compton, *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions*, NASA SP-4214 (Washington, D.C.: 1989).
44. Wendell Mendell, "What Did We Learn and Where Did it Lead?," Apollo 20th Anniversary Celebration Speaker's Series, July 20, 1989, Vertical Files, JSC History Office.
45. For a good and simplified description of the operation and components of the Space Shuttle, see Michael Collins, *Liftoff, The Story of America's Adventure in Space* (New York: NASA, Grove Press, 1988), 201-222.
46. Collins, 1988, 214-215; Ritchie, 1986, 45, 108, 118, 121, 143, 196, 206, 234.
47. Ritchie, 1986, 108-109; Collins, 1988, 203, 215.
48. Ritchie, 1986, 41-42; Eugene Horton, Personal Scrapbooks.
49. Ritchie, 1986, 74.
50. The NASA History Office, *Astronautics and Aeronautics, 1978*, 49-50.

Chapter 13

1. Interview, Henry C. Dethloff with Owen G. Morris, JSC, August 8, 1990.
2. See Audrey L. Schwartz, "Selling Space: The Product Life Cycle of the Manned Space Program 1957-1981," University of Houston-Clear Lake, Space Business Research Center (August 1989), Space Flight Justification Subseries, JSC History Office, an unpublished manuscript which relates the space program to a product "life cycle" for which the consumer appetite waned precipitously in the 1970's.
3. *Space News Roundup* (hereafter cited *Roundup*) (February 16, 1990). The Center spent some \$1.1 billion in fiscal year 1989 with Texas firms and out-of-state companies that pay salaries to employees in Texas. Texas followed California (\$2.7 billion) and Florida (\$1.2 billion) in states receiving NASA funds for contracts or grants.
4. *Roundup*, 1990.
5. Olin E. Teague Papers, Texas A&M University Archives, Boxes 222 and 224.
6. *Houston Magazine* (September, 1962) 26; (September 1963) 19, 20, 24; (March 1964) 26; (September 1964) 19-21.
7. Telephone interview, Henry C. Dethloff with Mayor Louie Welch, Houston, Texas, May 30, 1990.
8. Interview, Dethloff with Welch, 1990.
9. Interview, Dethloff with Morris, 1990.
10. Interview, Dethloff with Morris, 1990.
11. Interview, Dethloff with Morris, 1990; Interview, Dethloff with Welch, 1990.

12. Interview, Dethloff with Morris, 1990; Telephone interview, Dethloff with Hubert P. Davis, August 8, 1990.
13. Interview, Dethloff with Morris, 1990.
14. Interview, Dethloff with Morris, 1990
15. Interview, Dethloff with Morris, 1990; Telephone interview, Dethloff with Davis, 1990.
16. Telephone interview, Dethloff with Davis, 1990.
17. Telephone interview, Dethloff with Davis, 1990; Howard Benedict, *NASA: A Quarter Century of Space Achievement* (The Woodlands, Texas: Pioneer Publications, Inc., 1984), 209.
18. Eagle Aerospace, Informational Brochure (1990).
19. Space Industries, Inc., "Bringing the Promise of Space Down to Earth" (1990).
20. Interview, Henry C. Dethloff with Emyré Barrios Robinson, Clear Lake, Texas, July 17, 1990; Emyre Barrios Robinson (biographical).
21. Robinson (biographical); *Houston Chronicle* (August 21, 1988) and (July 20, 1990).
22. *Houston Chronicle*, 1988 and 1990.
23. Interview, Henry C. Dethloff with Miguel A. Hernandez, Jr., Jerome B. Hammack, and William R. Holmberg, Clear Lake City, Texas, March 6, 1990.
24. Interview, Dethloff with Hernandez, Hammack, and Holmberg. 1990.
25. Interview, Dethloff with Hernandez, Hammack, and Holmberg. 1990; Committee on Science and Technology, *Astronauts and Cosmonauts, Biographical and Statistical Data* (Washington, D.C.: Government Printing Office, December 1985), 135.
26. Interview, Dethloff with Hernandez, Hammack, and Holmberg, 1990.
27. Interview, Dethloff with Hernandez, Hammack, and Holmberg, 1990.
28. Interview, Dethloff with Hernandez, Hammack, and Holmberg, 1990.
29. *Houston Chronicle* (May 17, 1990).
30. Bryan-College Station *Eagle* (August 21, 1990); *NASA Spin-off* (August 1988), 4, 42-49.
31. NASA, JSC, Procurement Operations Branch, *Subcontracting Opportunities* (March 31, 1989), 1-19; NASA, JSC Almanac (May 1989), 109.

Chapter 14

1. Interview, Henry C. Dethloff with Owen Morris, Houston, Texas, August 8, 1990.
2. Interview, Dethloff with Morris, 1990.
3. Interview, Dethloff with Morris, 1990.
4. Interview, Dethloff with Morris, 1990; Rodney Rose, Comments on preliminary draft of Chapter 13.
5. Rose, Comments on Chapter 13.
6. Eugene F. Kranz and Christopher C. Kraft, Systems Engineering and Integration Process of NASA, JSC, Mission Operations Directorate, Final dated December 19, 1990 (scheduled for publication by the NASA Alumni League).
7. Kranz and Kraft, 1990.
8. Kranz and Kraft, 1990.
9. Interview, Henry C. Dethloff with N. Wayne Hale, Jr., JSC, October 19, 1989.
10. Interview, Henry C. Dethloff with Dennis Webb, JSC, July 19, 1990.

11. Interview, Dethloff with Webb, 1990; Interview, Dethloff with Hale, 1990.
12. National Space Transportation System Program in New Employee Handbook, JSC Management Subseries, JSC History Office.
13. Memoranda, Ad Hoc Shuttle Payload Activities Team, January 4 - January 31, 1974, Loftus Subseries, JSC History Office.
14. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
15. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
16. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
17. JSC Announcement 81-43, May 7, 1981, General Reference Series, JSC History Office; Glynn S. Lunney, Biographical Data Subseries, JSC History Office.
18. Interview, Henry C. Dethloff with Glynn S. Lunney, Houston, Texas, October 25, 1990, Oral History Series, JSC History Office.
19. Charles Olasky, "Shuttle Mission Simulator," NASA Conference Publication 2150, *11th Space Simulation Conference*, Houston, Texas, September 23-25, 1980, 113-125.
20. Interview, Dethloff with Morris, 1990; Roger E. Bilstein, *Orders of Magnitude: A History of the NACA and NASA, 1915-1990* (Washington, D.C.: 1989), 110-111; Neil McAleer, *The Omni Space Almanac; A Complete Guide to the Space Age* (New York: World Almanac, 1987), 69-70.
21. Bilstein, 1989, 69-70.
22. U.S. House of Representatives, Committee on Science and Technology, *Astronauts and Cosmonauts: Biographical and Statistical Data*, 99th Cong., 1st Sess. (Washington, D.C.: Government Printing Office, December 1985), 56, 164.
23. NASA Mission Report, "A Free People Capable of Great Deeds,"- The Story of STS-1, The First Space Shuttle Mission (MR-001), Vertical Files, JSC History Office.
24. NASA Mission Report (MR-001); House Subcommittee on Space Science and Applications, *Future Space Programs Report 1981*, 97th Cong., 2nd Sess. (Washington, D.C.: Government Printing Office, 1981), 4.
25. *Astronauts and Cosmonauts: Biographical and Statistical Data*, 1985, 63, 154; NASA, JSC, STS-2, Second Space Shuttle Mission Press Kit, September 1981, 1-35, STS-2 Documents Subseries, JSC History Office.
26. Second Space Shuttle Mission Press Kit, September 1981, 35-43.
27. *Future Space Programs*, 1981, 1-45.
28. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
29. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
30. Memoranda, Ad Hoc Shuttle Payload Activities Team, 1974.
31. NASA, JSC, STS-3, Third Space Shuttle Mission Press Kit, March 1982, 1-91, STS-3 Documents Subseries, JSC History Office.
32. NASA, "STS-4 Test Mission Simulates Operational Flight—President Terms Success "Golden Spike" in Space," Mission Report (MR-004), Vertical Files, JSC History Office.
33. NASA Mission Report (MR-001).

Chapter 15

1. Howard Allaway, *The Space Shuttle at Work* (Washington, D.C.: NASA, 1979), Foreword, 21-27, 51-63.

2. NASA Information Summaries (PMS-020A/JSC) March 1989; National Space Transportation System Program in New Employee Handbook, JSC Management Subseries, JSC History Office; Comparison between STS, Delta and Ariane by Coopers & Lybrand, July 1982, STS Management Subseries, JSC History Office.
3. Interview, Henry C. Dethloff with Dennis Webb, JSC, July 19, 1990.
4. JSC, NASA Facts, "Mission Control Center" (n.d.); NASA Information Summaries, "Space Shuttle Mission Summary, 1981-1983." See Joseph P. Allen with Russell Martin, *Entering Space, An Astronaut's Odyssey* (New York: Stewart, Tabori & Chang, 1984, Revised 1986), 59.
5. "Shuttle Mission Summary, 1981-1983."
6. "Shuttle Mission Summary, 1981-83." Note: A TDRS can handle up to 300 million bits of information each second from a single user spacecraft. It operates on Ku-band and S-band frequencies.
7. "Shuttle Mission Summary, 1981-83."
8. "Shuttle Mission Summary, 1981-83"; JSC News Release 80-038, May 29, 1980.
9. *Astronauts and Cosmonauts, Biographical and Statistical Data*, 13-14; Correspondence and Memorandum, Flight Crew Operations Subseries, JSC History Office. Note: See Correspondence from 1973 to 1978. The six women astronaut candidates recruited in 1978 were Anna Fisher (M.D.), Shannon Lucid (Ph.D., biochemistry), Judith Resnik (Ph.D., electrical engineering), Sally Ride (Ph.D., physics), Margaret Seddon (M.D.), and Kathryn Sullivan (Ph.D., geology). And see Hans Mark, *The Space Station, A Personal Journey* (Durham, North Carolina: Duke University Press, 1987), 57-58.
10. Mark, 1987, 57-58.
11. "Shuttle Mission Summary, 1981-1983"; JSC News Release 80-038, May 29, 1980.
12. JSC News Release 80-038, 1980.
13. "Shuttle Mission Summary, 1981-1983."
14. Neil McAleer, *The Omni Space Almanac: A Complete Guide to the Space Age* (New York: World Almanac, 1987), 14,78.
15. McAleer, 1987, 14,78.
16. McAleer, 1987, 14,78.
17. Mark, 1987, 57-58, 188-90.
18. NASA Facts, "Space Shuttle Mission Summary 1984, STS Missions 41-B Thru 51-A," Kennedy Space Center; Allen with Martin, 1984, 223-224.
19. "Shuttle Mission Summary, 1984"; McAleer, 1987, 84-86; NASA, Headquarters, Washington, D.C. and Goddard Space Flight Center, Greenbelt, Maryland, Press Release 80-16, February 6, 1980.
20. "Shuttle Mission Summary, 1984."
21. "Shuttle Mission Summary, 1984"; Mark, 1987, 205.
22. "Shuttle Mission Summary, 1984."
23. Henry S.F. Cooper, Jr., *Before Lift-Off, The Making of a Space Shuttle Crew* (Baltimore: Johns Hopkins University Press, 1987), 17.
24. Cooper, 1987, 17.
25. NASA, "Teacher in Space Project," 1985, STS-51L Documents Subseries, JSC History Office.
26. Cooper, 1987.
27. Cooper, 1987, 17.
28. Cooper, 1987, 17; Allen with Martin, 1984, 223-236.

29. Cooper, 1987, 17; Allen with Martin, 1984, 231.
30. Allen with Martin, 1984, 231-236; "Shuttle Mission Summary, 1984."
31. "Shuttle Mission Summary, 1984."
32. Mark, 1987, 67.
33. Mark, 1987, see especially 68-88.
34. Mark, 1987, see especially 68-88.; Interview, Henry C. Dethloff and David Norton with Gerald Griffin, Houston, Texas, April 16, 1990.
35. Mark, 1987.
36. "Shuttle Mission Summary 1984"; *Washington Post* (April 11, 12, 1985).
37. "Shuttle Mission Summary, 1984."
38. "Shuttle Mission Summary, 1984."
39. "Shuttle Mission Summary, 1984."
40. "Shuttle Mission Summary, 1984."
41. "Shuttle Mission Summary, 1984."
42. "Shuttle Mission Summary," 1984."
43. Mark, 1987, 195.
44. "Shuttle Mission Summary, 1984."
45. "Shuttle Mission Summary, 1984."
46. NASA Press Kit, "Space Shuttle Mission 51-L," (January 1986) STS 51-L Documents Subseries; and see, 51-L Investigation Subseries, JSC History Office.
47. Presidential Commission on the Space Shuttle Challenger Accident, Biographies, n.d., STS 51-L Investigation Subseries, JSC History Office.
48. Memorandum, John W. Young, Chief, Astronaut Office to Director, Flight Crew Operations (cc: R.H. Truly, Hqs, and others) March 4, 1986; Letter, Richard L. Griffin to John W. Young, March 12, 1986, STS 51-L Investigation Subseries, JSC History Office.
49. Memorandum, Young, 1986; Letter, Griffin, 1986.
50. STS 51-L Investigation Subseries, JSC History Office.
51. See Summaries of Meetings with the Mission Planning and Operations Panel of the Presidential Commission on the Space Shuttle Challenger Accident, under cover dated May 15, 1986, STS 51-L Investigation Subseries, JSC History Office.
52. Report of the Presidential Commission on the Space Shuttle Challenger Accident, Washington D.C.: June 6, 1986, 19.
53. Report on Challenger Accident, 1986, 120-48.
54. Report on Challenger Accident, 1986, 120-48.
55. Report on Challenger Accident, 1986, 120-48.
56. *Houston Chronicle* (September 25, 1988, October 8, 1988, November 13, 1988, January 22, 1989, February 23, 1990); Bruce Murray, "Whither America in Space?" *Issues in Science and Technology* (Spring 1986), 22-45; John M. Logsdon, "The Space Shuttle Program: A Policy Failure?" *Science* (30 May 1986), 1099-1105; Sally K. Ride, *Leadership and America's Future in Space, A Report to the Administrator* (Washington, D.C.: August 1987), 1-63.
57. Memorandum, Jesse W. Moore, JSC to NASA Headquarters, Response to Recommendations of the Presidential Commission on the Space Shuttle Challenger Accident, June 13, 1986, STS 51-L Mission

- Subseries, JSC History Office; *Report to the President, Actions to Implement the Recommendations of the Presidential Commission on the Space Shuttle Challenger Accident: Executive Summary* (Washington, D.C.: NASA, July 14, 1986), 1-5.
58. Jon D. Miller, The Impact of the Challenger Accident on Public Attitudes Toward the Space Program, A Report to the National Science Foundation, Public Opinion Laboratory, Northern Illinois University, DeKalb, Illinois, January 25, 1987, STS 51-L Mission Subseries, JSC History Office.

Chapter 16

1. Interview, Henry C. Dethloff with William Huffstetler, JSC, November 8, 1990.
2. Sylvia Doughty Fries, "Recovering from Challenger," *Action* Volume 10, Number 10 November/December, 1990, 11-13.
3. Interview, Henry C. Dethloff with Gerald D. Griffin, Houston, Texas, April 16, 1990.
4. Interview, Dethloff with Griffin, 1990; NASA, *Astronautics and Aeronautics, 1985: A Chronology*, NASA SP-4025 (Washington, D.C.: NASA History Series, 1988), 176-185.
5. *Astronautics and Aeronautics, 1985: A Chronology*, 1988, 176-185.
6. John M. Logsdon, "The Space Shuttle Program: A Policy Failure?" *Science* (30 May 1986), 1099-1105; Alcestis R. Oberg, "After the Parades," *Final Frontier* (September/October 1990), 43-59.
7. The lack of purpose and direction particularly affected development of the space station program.
8. See note 7; Thomas J. Lewin and V.K. Narayanan, *Keeping the Dream Alive: Managing the Space Station Program, 1982-1986* (Washington, D.C.: NASA, 1990), 111, 116-17.
9. Lewin and Narayanan, 1990, 107-23, 177, 179, 181.
10. Lewin and Narayanan, 1990, 107-23, 177, 179, 181, 1990; Interview, Henry C. Dethloff with Aaron Cohen, JSC, January 3, 1991.
11. Interview, Dethloff with Cohen, 1991.
12. Interview, Dethloff with Cohen, 1991.
13. These are conclusions reached by the author from comments both explicit and implicit in interviews with various JSC persons including prominently, Gerald Griffin, Aleck Bond, Christopher Kraft, Owen Morris, and Max Faget.
14. Sally K. Ride, *Leadership and America's Future in Space, A Report to the Administrator* (Washington, D.C.: NASA, August 1987), 1-63; Aaron Cohen, Biographical Data Subseries, JSC History Office.
15. Aaron Cohen, Biographical Data Subseries, JSC History Office.
16. Interview, Dethloff with Huffstetler, November 11, 1990.
17. See National Academy of Public Administration, *The NASA Organization and Its Needs for the Future* (June 1985), 1-12, NASA Management Subseries, JSC History Office.
18. Interview, Dethloff with Huffstetler, 1990.
19. Interview, Dethloff with Huffstetler, 1990.
20. Interview, Dethloff with Huffstetler, 1990.
21. Interview, Dethloff with Huffstetler, 1990.
22. *Space News Roundup* (February 20, 1963).
23. *Houston Magazine* 35(September 1964)8:26, 40(May 1969)4:52; See Sullivan Management Subseries, JSC History Office.
24. Fred J. Benson to Honorable Olin E. Teague, January 27, 1966, Olin E. Teague Papers, Texas A&M University Archives, Box 224.

25. Statement of Homer E. Newell, Associate Administrator for Space Science and Applications, NASA, before the Subcommittee on Space Sciences and Applications, Committee on Science and Astronautics, House of Representatives, Olin E. Teague Papers, Texas A&M University Archives, Box 224.
26. Interview, Henry C. Dethloff with Oran Nicks, December 19, 1990; Interview, Henry C. Dethloff with W. Arthur Porter (former Director, Texas Engineering Experiment Station), The Woodlands, Texas, October 23, 1990; Biographical data, David J. Norton and Oran Nicks, Intaglio Files and Records, College Station, Texas.
27. Interview, Dethloff with Nicks, 1990.
28. Interview, Dethloff with Nicks, 1990.
29. Interview, Dethloff with Nicks, 1990.
30. Space Research Center Files and Records, SRC-History, Texas A&M University, College Station, Texas.
31. Space Advisory Board, January 10, 1985, Meeting; Space Board Advisors Meeting, September 27-28, 1985; Proposal to Define a Space Engineering Research Center (October 1984) in Space Research Center Files and Records, David J. Norton-Correspondence, and SRC-History. Texas A&M University faculty and personnel most actively involved included Norton, Nicks, Walter Haisler, Jo Howze, Carl Erdman, Richard Thomas, Robert Merrifield, Duwayne Anderson, and H.H. Richardson; Memorandum, David J. Norton to Henry C. Dethloff (January 3, 1991), Intaglio Files and Records, College Station, Texas.
32. Memorandum, Norton to Dethloff (January 3, 1991), Intaglio Files and Records, College Station, Texas.
33. Space Research Center, Activity Summary, 1985-1990, Presentation to NASA JSC Officials, November 7, 1990, Space Research Center Files and Records; Interview, Dethloff with Huffstetler, 1990; Interview, Dethloff with Nicks, 1991.
34. Interview, Dethloff with Porter, 1990.
35. Interview, Dethloff with Porter, 1990.; Memorandum, Norton to Dethloff (January 3, 1991).
36. University of Houston, Space Vacuum Epitaxy Center, (n.p., n.d.), Intaglio Files and Records, College Station, Texas.
37. University of Houston-Clear Lake, Space Business Research Center, information sheet.
38. See Official Program and Exhibits Guide, 3rd Annual Space Technology Commerce and Communications Conference & Exhibition, November 14-16, 1989, George R. Brown Convention Center, Houston, Texas; Memorandum, Norton to Dethloff (January 3, 1991).
39. Memorandum, Norton to Dethloff (January 3, 1991).
40. Interview, Dethloff with Cohen, 1990.
41. Interview, Dethloff with Aaron Cohen (and Daniel Nebrig), January 3, 1991.
42. National Commission on Space, *Pioneering the Space Frontier* (New York: Bantam Books, 1986), i-4.
43. National Commission on Space, 1986, 8-11.
44. National Commission on Space, 1986, 11-12.
45. National Commission on Space, 1986, 11-12, 180. Commission members included Luis W. Alvarez, Neil A. Armstrong, Paul J. Coleman, George B. Field, William H. Fitch, Charles M. Herzfeld, Jack L. Kerrebrock, Jeane J. Kirkpatrick, Gerard K. O'Neill, Thomas O. Paine (chairman), Bernard A. Schriever, Kathryn D. Sullivan, David C. Webb, Laurel L. Wilkening, and Charles E. Yeager.
46. Ride, 1987, 5.
47. Ride, 1987, 5-11.
48. Ride, 1987, 12.
49. Ride, 1987, 13, 15-63.

50. See JSC organization charts, March 1985, March 1986, April 1987, Organizational Subseries, JSC History Office; James C. Fletcher, Summary of Major Actions Taken or in Work in Response to the Recommendations of the NASA Management Study Group, January 7, 1986, Charlesworth Subseries, JSC History Office; JSC Announcement 86-163, December 11, 1986, General Reference Series, JSC History Office.
51. JSC Announcement 86-163.
52. *Houston Chronicle* (September 28, 1988, 24A and October 24, 1988).
53. *Houston Chronicle* (September and October, 1988).
54. *Houston Chronicle* (September 28, 1988), 24A; Roger E. Bilstein, *Orders of Magnitude: A History of the NACA and NASA, 1915-1990* (Washington, D.C.: NASA, 1989), 137-138.

Chapter 17

1. Interview, Henry C. Dethloff with his grandchildren, Brian and Stephen (age 5), Wylie, Texas, July 20, 1990.
2. *Houston Chronicle* (February 19, 1988, April 8, 1989).
3. *Houston Chronicle*, 1989; *Space News Roundup* (hereafter cited *Roundup*) (September 30, 1988).
4. *Roundup* (September 23, 1988).
5. *Houston Chronicle* (April 8, 1989), 8A.
6. Charles Murray and Catherine Bly Cox, *Apollo: The Race to the Moon* (New York: Simon and Schuster, 1989); *New York Times National* (September 9, 1990); and see Alcestis R. Oberg, *Pioneering the Space Frontier: Living on the Next Frontier* (New York: McGraw-Hill, 1986); *Houston Chronicle* (June 25, 1989, September 21, 1988).
7. *New York Times* (February 12, 1987), reprinted in NASA Current News, February 12, 1987.
8. *Houston Chronicle* (September 26, 1988).
9. *Houston Chronicle* (August 4, 1988); The Gallup Poll, *News Service* (July 19, 1989).
10. *Roundup* (October 3, 1988); *Houston Chronicle* (November 15, 1988).
11. *Roundup* (May 6, October 3, 1988); *Clear Lake Area Magazine* (1st Quarter 1990), 7, 9-12; Manned Space Flight Education Foundation, Inc., *Countdown*, I (March 1988)1: 1-4.
12. *Houston Chronicle* (March 26, 1990); Harold Stall presentation at a Partners in Space Symposium, JSC, May 11, 1989.
13. *Houston Chronicle* (December 9, 1988).
14. *Roundup* (October 28, November 11, December 9, 16, 1988 and January 6, 13, 20, 27, 1989).
15. *Roundup* (March 10, 17, 1989).
16. *Roundup* (April 7, 1989).
17. *Houston Chronicle* (April 16, 1989); *Roundup* (October 22-28, 1990).
18. *Roundup* (March 24, June 2, 1989).
19. *Roundup* (June 16, 1989).
20. *Roundup* (May 26, June 2, 16, August 4, 11, 1989); Aaron Cohen, *Report on the 90-Day Study on Human Exploration of the Moon and Mars* (NASA: Washington, D.C., November 1989).
21. *Roundup* (June 16, November 3, 1989).
22. *Roundup* (June 30, 1989).

23. *Roundup* (June 30, March 31, 1989).
24. *Roundup* (June 30, March 31, 1989).
25. Aaron Cohen, "Project Management: JSC's Heritage and Challenge," *Roundup* (March 31, 1989); Executive Office of the President, *Quality Improvement Prototype Award, 1990*, JSC, NASA.
26. *Roundup* (March 31, 1989).
27. Interview, Henry C. Dethloff with Glenn S. Lunney, Rockwell International, Houston, Texas, October 25, 1990.
28. Note: The author attended and taped the 3-day sessions, which are also available on videotape from the JSC Public Information Office.
29. *Roundup* (July 21, 1989); *Houston Post* (July 21, 1989).
30. *Roundup* (August 18, 25, October 20, November 3, 1989).
31. *Roundup* (September 15, November 3, December 2, 1989).
32. *Roundup* (December 22, 1989).
33. *Roundup* (November 17, 1989, April 13, August 10, 1990).
34. Aaron Cohen, *Report on the 90-Day Study on Human Exploration of the Moon and Mars*, transmittal letter, Aaron Cohen to Vice Admiral Richard H. Truly, and 1-1 to 1-2.
35. *Report on the 90-Day Study*, i.
36. *Report on the 90-Day Study*, 1-1 to 1-9.
37. *Report on the 90-Day Study*, 1-3 to 1-9.
38. *Report on the 90-Day Study*, 2-1 to 9-13.
39. *Report on the 90-Day Study*, transmittal letter; and see NASA, *The Exploration Initiative, a long-range, continuing commitment* (NASA: JSC [Barrios3], March 1990), n.p.
40. *Roundup* (March 9, 1990).
41. *Roundup* (March 23, 30, April 13, 20, 27, May 18, 25, June 1, 8, July 6, 1990).
42. *Roundup* (May 25, June 1, 8, 15, 22, July 6, 13, 1990).
43. Advisory panel members: Laurel L. Wilkening, the Provost and Vice President for Academic Affairs at the University of Washington and a former director of the Lunar and Planetary Laboratory; Edward C. "Pete" Aldridge, Jr., President of McDonnell Douglas Electronic Systems was Secretary of the Air Force (1986-1988) and a former astronaut; Joseph P. Allen, President, Space Industries, Inc. of Houston, a former astronaut, holds a doctorate in physics from Yale University; D. James Baker, President of Joint Oceanographic Institutions, Inc. in Washington, D.C., was a distinguished scientist; Congressman Edward P. Boland received the National Science Foundation Distinguished Public Service Award in 1986; Daniel J. Fink, an independent management consultant, was a former vice president of General Electric's Aerospace Group; Don Fuqua, President and General Manager of Aerospace Industries Association, was a former 12-term Congressman from Florida; Retired General Robert T. Herres once served as Commander-in-Chief of the U.S. Space Command and years earlier was the Chief of the Flight Crew Division for the Air Force Manned Orbiting Laboratory project; David T. Kearns was Chairman of Xerox Corporation; Louis J. Lanzerotti a distinguished professor and member of the technical staff of AT&T Bell Laboratory; Thomas O. Paine, NASA's former Administrator. *Roundup* (August 31, September 21, October 12, 19, 1990).
44. *Roundup* (September 28, October 5, October 12, 1990).
45. *Roundup* (October 19, 26, November 9, 16, 30, 1990).
46. *Roundup* (August 3, November 30, 1990).

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47. *Report of the Advisory Committee on the Future of the U.S. Space Program* (Washington, D.C.: Government Printing Office, December 1990), 1-59.
48. *Report of the Advisory Committee*, 1990, 1.
49. *Report of the Advisory Committee*, 1990, 2-3.
50. *Report of the Advisory Committee*, 1990, 3-6.
51. *Report of the Advisory Committee*, 1990, 6-9.
52. *Report of the Advisory Committee*, 1990; *Houston Chronicle* (January 27, 1991).
53. *Report of the Advisory Committee*, 1990, 7-9.
54. *Report of the Advisory Committee*, 1990, 42, 46-48
55. *Report of the Advisory Committee*, 1990.
56. *Report of the Advisory Committee*, 1990.
57. Paul E. Purser and William M. Bland, Jr. to Dr. James C. Fletcher, October 10, 1988; Richard H. Truly to Paul E. Purser and William M. Bland, Jr., December 8, 1988; Purser and Bland to Truly, January 6, 1989, in personal papers of Paul E. Purser.
58. H. Hollister Cantus, Associate Administrator for External Relations, to Distribution, October 6, 1988, with NASA Historical Note HHN-161, *Crossing the Next Frontier: Precedents for a National Space Program from the History of the United States* (September 1988).