Card Model Building Instructions for:

Apollo Command Module Block II

Missions: Apollo - 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 & 17
Skylab - 1, 2, 3 & 4
Apollo-Soyuz Test Project (ASTP)

Carl Hewlett, March 24, 2007
(Edited by Mike Vink)

1st, a look at the Mission History:

Command Module.

Part of:	Apollo CSM.	Communications Systems:	100 kg (220 lb).
Class:	Manned.	Crew Seats and Provisions:	550 kg (1,210 lb).
Type:	Spacecraft Module.	Crew mass:	216 kg (476 lb).
Crew Size:	3.	Miscellaneous Contingency:	200 kg (440 lb).
Length:	3.47 m (11.38 ft).	Env. Control System:	200 kg (440 lb).
Basic Diameter:	3.90 m (12.70 ft).	RCS Coarse No x Thrust:	12 x 410 N.
Maximum Diameter:	3.90 m (12.70 ft).	RCS Propellants:	N2O4/UDMH.
Habitable Volume:	6.17 m3.	RCS Isp:	290 sec. RCS
Mass:	5,806 kg (12,800 lb).	Impulse:	257 kgf-sec.
Structure Mass:	1,567 kg (3,454 lb).	Main Engine Propellants:	n/a.
Heat Shield Mass:	848 kg (1,869 lb).	Main Engine Propellants:	75 kg (165 lb).
Reaction Control System:	400 kg (880 lb).	L/D Hypersonic:	0.30.
Recovery Equipment:	245 kg (540 lb).	Electrical System:	Batteries.
Navigation Equipment:	505 kg (1,113 lb).	Electric System:	20.00 KWh.
Telemetry Equipment:	200 kg (440 lb).	Battery:	1,000.00 Ah.
Electrical Equipment:	700 kg (1,540 lb).		

You will need the following items:

1. PDF reader software
2. Computer Printer, (Color), with 8 ½”x11” media carriage
3. 8 ½”x11” bond copy paper
4. 8 ½”x11” card stock paper
5. Clear drying PVA Glue
6. Clear drying Glue Stick
7. Hobby Knife
8. Scissors
9. Straight edge, (For cutting guide).

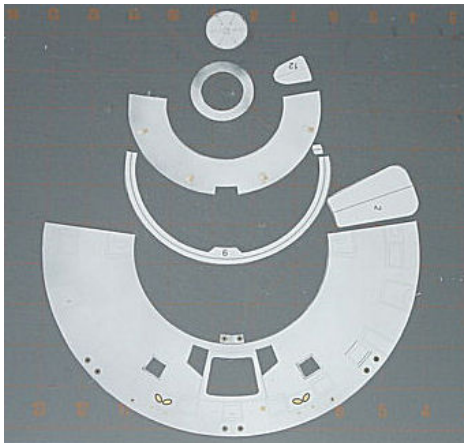
Prepare for your build by doing the following steps:

1. Plot/print the Parts in the PDF file.
2. Plot/print with the “fit to page” feature turned off.
3. Cut parts out on a cutting surface, (i.e. cutting board or mat). This protects the table and prolongs the life of your knife blade.

Steps for Build:

1. Cut out parts 1 & 2. Glue part 2 to the inside (blank) side of part 1. Roll, fit and glue part 1 into a cone.

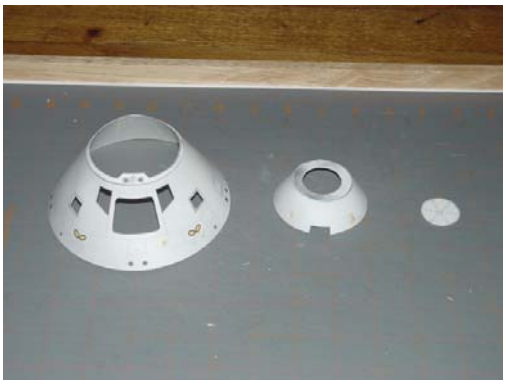
   NOTE. It is advisable to cut out the hatch and windows areas before gluing. These are the "X-ed" out areas of parts 1, 3, 3a, 7 and 8. You can cut them out after gluing if you have a soft touch and a really sharp knife blade.



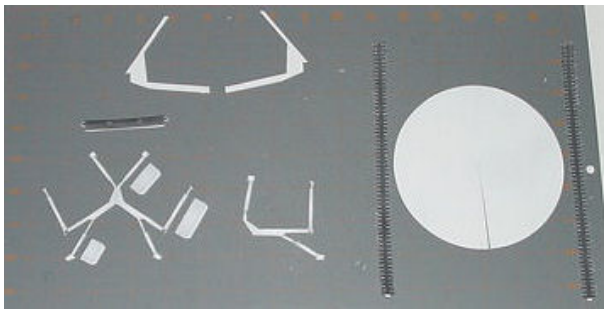
2. Cut out and score Parts 3 & both sets of 3a (2 ea.) and set aside for now.
3. Cut out and score part 4. This is the CM/SM umbilical shroud. Form and glue as per the cross-section view (pg 14). Set completed part aside for now.
4. Cut out and score parts 5 & 6. Form and glue into hand rails (Set part 5 aside for now). Glue part 6 (4 ea.) to part 1 cone, below the hatch and to the right, and below the right window. Use the marked dots for location points. The handles should be vertical (up & down) - NOT horizontal (side to side).
5. Cut out parts 7 and 8. Part 8 can be detailed with parts from page 15 or simply left as painted on the page of the version you are building.

   **** If you are detailing the hatch assembly, complete instructions start on Pg 10. ****

6. Laminate part 8 to the back of part 7. Cut out, score, fold and glue part 8b, Hinges (on Pg 12), to part 7/8.
7. Glue part 5, hand rail to the right side of the hatch (Part 7/8), using the marked dots for location points. Set hatch assembly aside for now.
8. Glue part 3a to the side window locations on part 1 cone, painted side out (This will give some mass to the exterior window frame).
9. Using the window film templates on Pg 1, cut out and glue clear plastic film to the back sides of part 3 (2 ea) & side window locations of the cone (Part 1).
10. Cut out parts 9 & 10. Glue part 10 to the inside (blank) side of part 9. Roll into a cone with the marking on the outer side & glue together. Place at the top of the part 1 cone, gluing from the inside of the cone, leaving the top half exposed from the marker line up *(THIS PART IS FOR PRE-FLIGHT OR FLIGHT VERSIONS ONLY, NOT POST FLIGHT VERSIONS).*



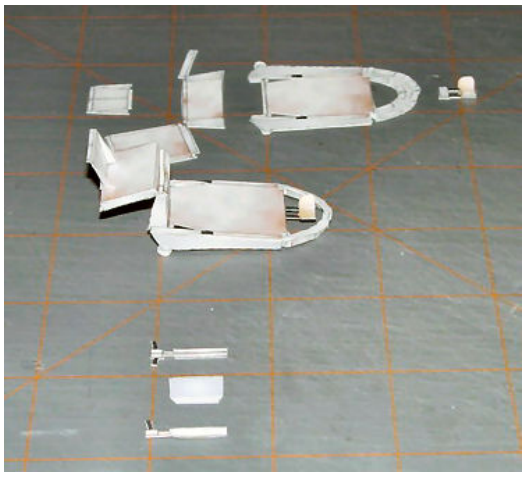
11. Cut out parts 11 & 12. Glue part 12 to the inside (blank) side of part 11. Roll into a cone & glue, setting aside for now.
12. Cut out the center circle of Part 13 before cutting out Part 13 itself, but do not discard the center circle.
13. Cut out 2 each, parts 14, 15 & 16, setting them aside for now, (You may want to print these on regular, bond copy paper for ease of rolling later).



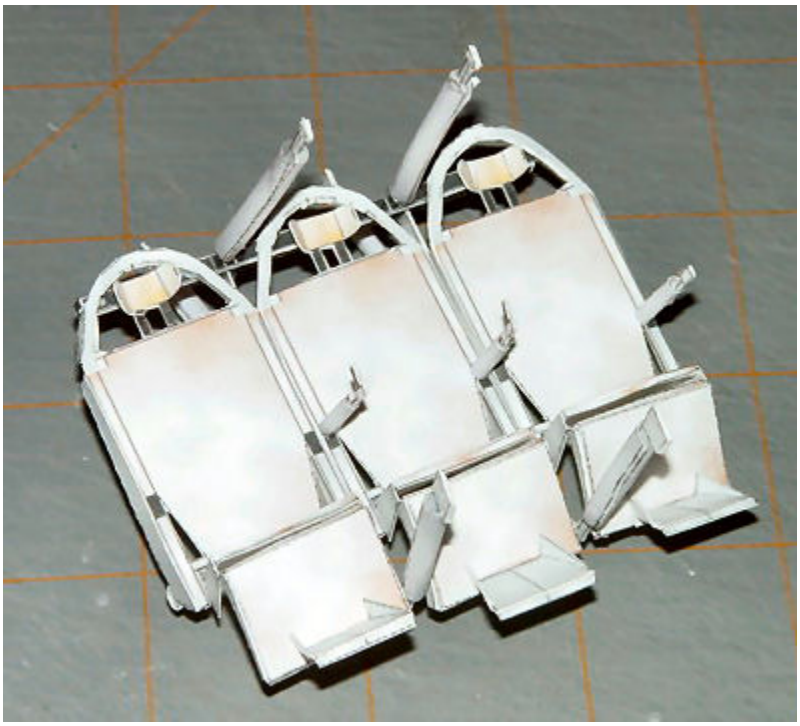
14. Cut out, score and fold Parts 17 in half on centerline, (Glue (laminate) to itself to form a 2-sided part).
15. Roll parts 14, 15 & 16 into cylinders around part 17 at the arm points they are positioned close to on the page and glue in place.
16. Cut out, score, fold and glue part 18 into a box beam.

Caution: Parts 19 & 20 are complex parts. Please study the cross-sections carefully before attempting these.

17. Cut out, score, fold and glue part 19 into the chair shape shown on the cross-section page.
18. Cut out, score, fold and glue part 20 into the chair seat shape shown on the cross-section page.

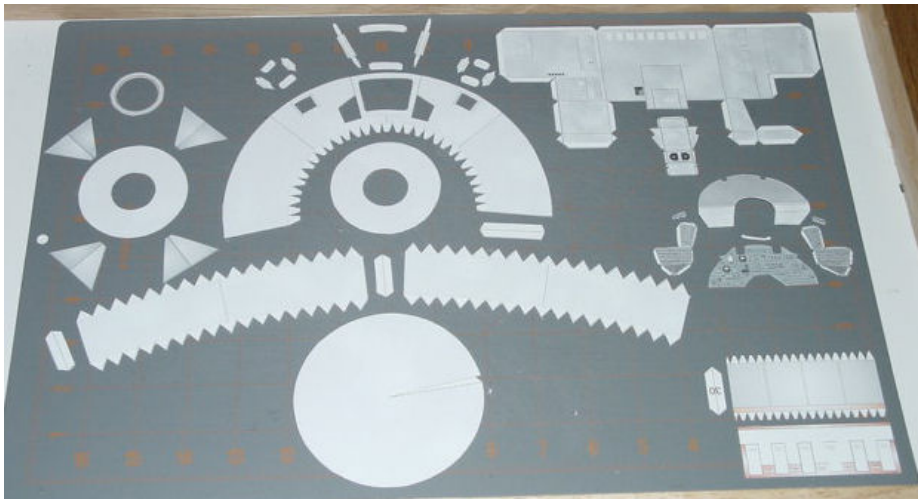


19. Cut out part 24 (You may want to laminate this part to heavy card stock first).
20. Glue part 24 (headrest) inside the radial void (half-circle opening) at the top of part 19. The bottom glue tab should slip under the seat back.
21. Cut out, score and fold part 25. Glue to bottom of part 20 to make the foot pan.
22. Glue part 20/25 to bottom of part 19, referring to the cross-section drawing on Pg. 15 for position info.
23. Cut out part 21 and set aside for now (Again, you may want to print these on bond copy paper for ease of rolling later).
24. Cut out, score, fold and glue parts 22 & 23 into 2-sided parts.
25. Roll part 21 into a cylinder around parts 22 & 23. Glue these assemblies to the side rails of part 19, referring to the cross-section drawing on Pg. 15 for position info.
26. Glue the three completed chairs to the two parts 17 (shock absorb. system) and part 18 (Box beam), referring to the cross-section drawing on Pg. 15 for position info. Set this assembly aside to dry.



27. Cut out and score (2) part 26's. Glue these together to make 1 strip and then glue into a cylinder.
28. Cut out part 27. Fit and glue into a cone. Fit and glue part 26 (cylinder) to the edge of part 27. Set this assembly aside for now.

29. Laminate part 28 to heavy card stock. Cut out and set aside for now.



30. Cut out, score, fold and glue 4 part 29's into 2-sided parts and set aside for now.
31. Cut out and score part 30 & 31. Glue part 30 to the inside (blank) side of part 31. Roll into a cylinder with the printed side out and glue part 30 to the inside (blank) side of part 31 again.
32. Cut out part 32. Reverse-roll so the printing is on the inner surface and glue into place inside cylinder 31.
33. Laminate part 33 to heavy card stock. Cut out and set aside for now.
34. Cut out parts 34 & 35. Glue part 34 to the reverse (blank) side of part 35. Again, reverse-roll part 35 into a cone with the printed side inward and glue the second half of part 34 to the blank side of part 35.

NOTE. Once again, It is advisable to cut out the hatch and windows areas before gluing. These are the "X-ed" out areas of part 35. It can be difficult to cut them out after gluing as they are marked on the inner surface of the cone.

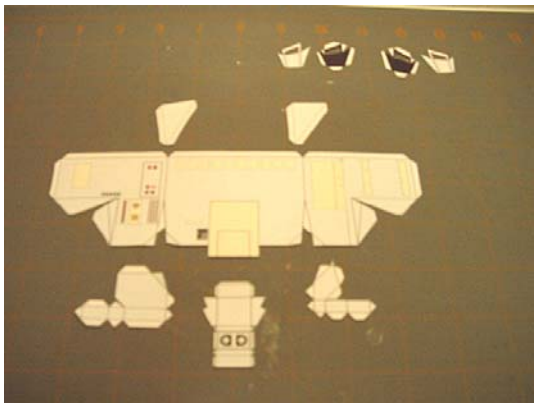
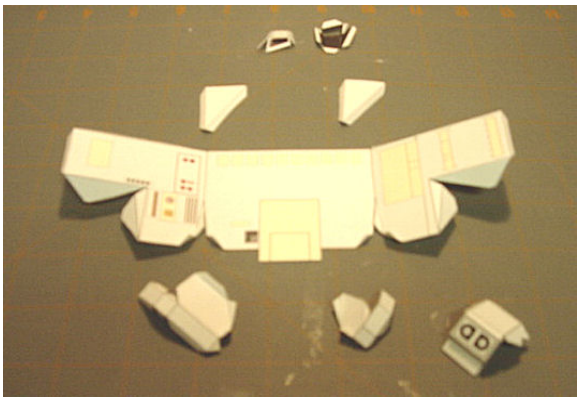
35. Cut out and score, 2 each of parts 36 & 37 and glue into a square box shape with the colored side on the inner walls of the square.

    NOTE: The part 37's farthest away from the part 35 (cone) are longer than the closer part 37's. This is intentional. Please be sure to orient these correctly when you glue them in place at the side window locations ON THE BLANK SIDE of the part 35 cone. These parts form the window sills between the inner and outer walls of the capsule.

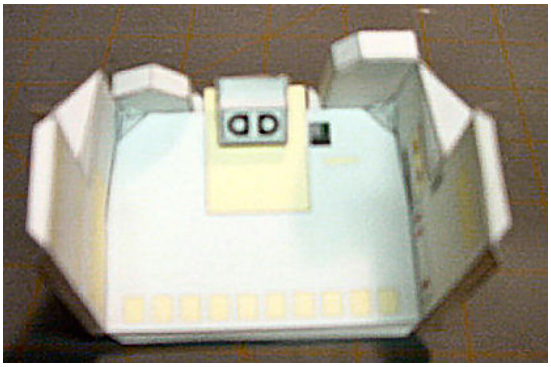
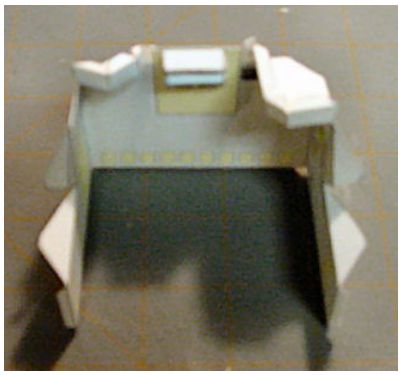
36. Cut out and score parts 38, 39 & 40 and glue together to create the main hatch frame. Glue this assembly in place at main hatch location on the blank side of the part 35 cone just like the window sills in the previous step.
37. Retrieve the two part 3 and 3a's that look like the part 3's. Glue clear window film onto rear, blank side of the window opening of the part 3's. Glue the part 3'a to the blank side of the part 3's, sandwiching the clear windows between the two parts. Insert the two assemblies into the window locations next to the hatch, pushing the tabs through the opening and gluing them on the outside (blank side) of the part 35 cone.

38. Fold the tabs on the bottom of cylinder 31 (the end AWAY from the orange stripe) inward and glue to the back of part 28. You may need to trim excess material from the tabs showing inside of the ring to make a clean opening.
39. Fold the tabs on the opposite end of cylinder 31 outward and glue to the blank side of part 33 to hide the glue tabs.
40. Glue part 33 to top of 35. The tabs of part 35 should be on the blank side of part 33. There is a second part 33 on Pg 10. Cut out and glue this extra part 33 on the inside of the cone 35 with the finished side inward to cover the glue tabs joining part 35 to the original part 33 assembly.
41. Glue the 4 part 29's to the outside of the part 31 cylinder using the vertical lines on the cylinder as reference points.

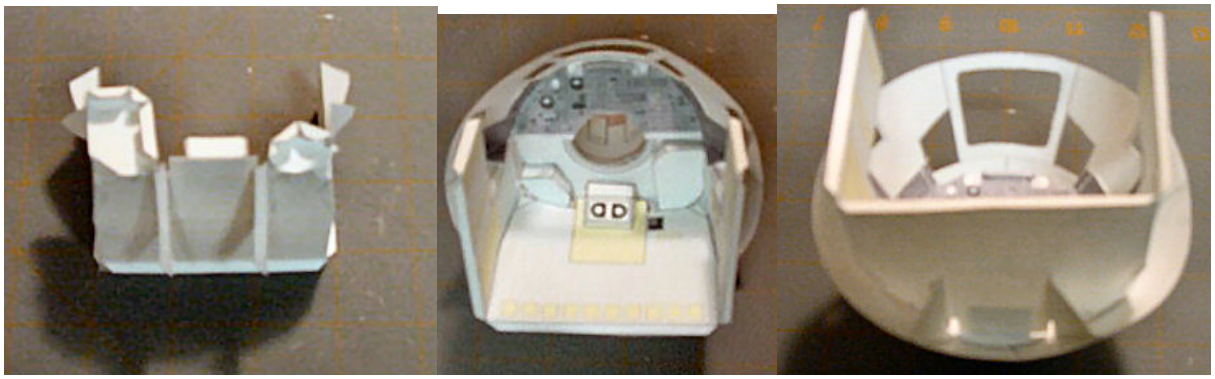

42. Cut out and score both sets of parts 41 & 42. Glue part 41 to the inside (blank) side of part 42. Glue both 41/42 sets assembly to assembly and roll & glue into a cone with the colored side inward.
43. Glue the part 41/42 cone assembly to the bottom of part 35 cone. Glue the tabs to the outside, blank area of part 35.
44. Cut out, score and fold, part 44, referring to the cross-section drawing on Pg. 15 to properly configure.

45. Cut out, score, fold and glue in place part 45 onto part 44, referring to the photos below for configuration and location.

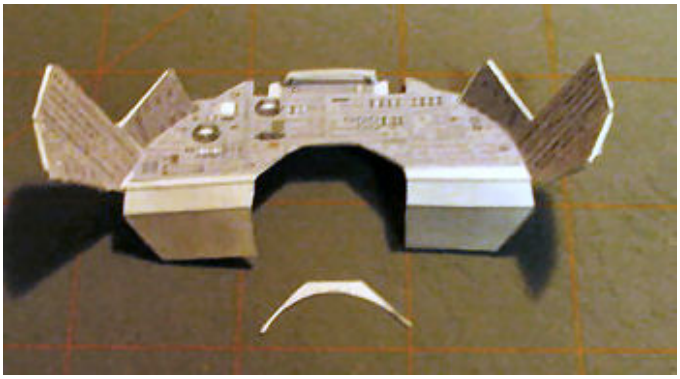



46. Cut out, score and fold parts 44a and 44b and glue onto part 44, referring to the photos below for configuration and location.



47. Cut out, score and fold part 46, referring to the cross-section drawing on Pg. 15 for configuration.

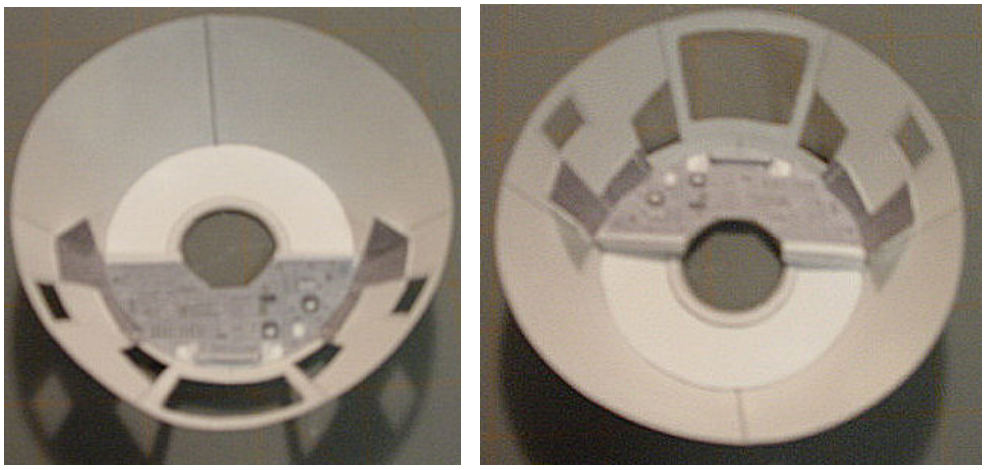
48. Cut out and glue in place part 47 to the printed face of 46. Trim off the excess at the bottom center of part 46 to match the outline of part 47's bottom.



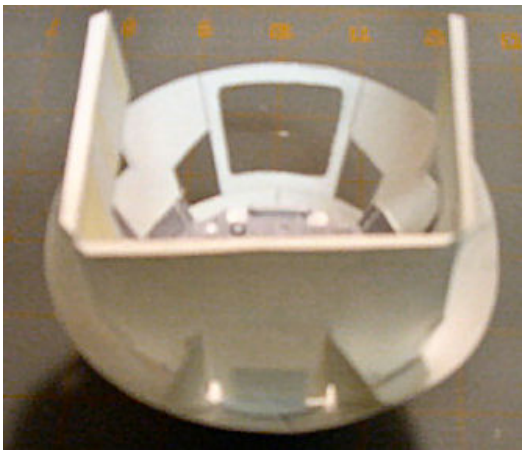
49. Cut out, score, fold and glue in place part 47c, (Hand-rail) to the top of the instrument panel, referring to the cross-section drawing on Pg. 15 for configuration and location.

50. Cut out, score, fold, and glue in place part 47a & 47b, (Side Panels), referring to the cross-section drawing on Pg. 15 for configuration and location.

51. Glue the part 46/47 assembly into place inside the part 33/35 assembly as shown in the photos below.

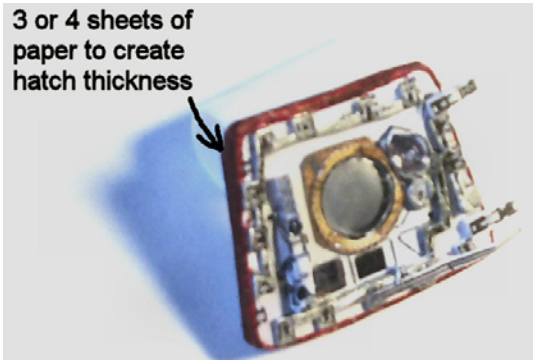


52. Position and glue the entire part 44 assembly into the part 33/35 cone assembly, taking care to align the assembly to the instrument panel and windows. Refer to the photos below and the cross-section drawing on Pg. 15 for configuration and location.

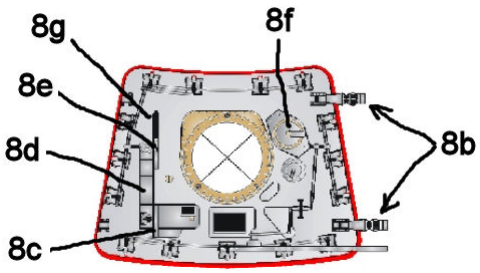


53. Cut out, score, fold and glue into position, two parts 44c to the rear of part 44 as shown above. This will add structural integrity and support for the chair/box beam assembly added in the next step.
54. Retrieve the completed chair/box beam assembly (parts 17/18), and glue to the part 44/45 assembly and the inside of the part 35 cone, referring to the cross-section drawing on Pg. 15 for configuration and location.
55. Laminate parts 56 & 57 to heavy card stock, cut out and set aside.
56. Cut out, score, fold and glue parts 48 thru 52, (these parts assemble into the docking probe). (Part 51 may need to be printed on bond copy paper for ease of rolling).
57. Cut out, score, fold, and glue, parts 53 and 54, assembling these into the interior hatch handle). (Part 54 may need to be printed on bond copy paper for ease of rolling).
58. Cut out part 55 and glue the back of part 56 to printed side of part 55.
59. Cut out part 58 and glue into a dish with the markings on the inside, gluing the tab to the outer, back side of the dish.
60. Glue part 58 to backside of part 55.
61. Slide part 57 over 58, and glue in place.
62. Glue part 53/54 (handle), to part 58.
63. Glue part 48 thru 52, (docking probe), to face of part 55 and set aside for now.
64. Cut out part 43 and glue into a dish with the finish on the inside, gluing the tab to the outer, back side of the dish.
65. Glue Part 43 to part 41/42 assembly, making sure the tabs glue to the blank side of the cone.
66. Laminate 6 pieces of part 66 to heavy card stock. Place and glue to outside of 35/41/42 assembly at equal distances around the perimeter.
67. Insert the 35/41/42 assembly into the part 1 cone and glue into place, referring to the cross-section drawing on Pg. 15 for location. Make sure the windows and hatch openings line up.
68. Cut out, score, fold and glue part 60, (Mortar can shield).
69. Cut out part 61 and glue to unprinted area of folded part 60.
70. Glue part 60 into position on part 31.
71. Cut out, score, roll and glue, two part 65's (Mortar can) into cylinders with the printed side outward.
72. Cut out and glue two part 63's to the bottom of the part 65 cylinders with the printed side inward.
73. Cut out, roll and glue two part 64's to the inside of the part 65 cylinders with the printed side inward.

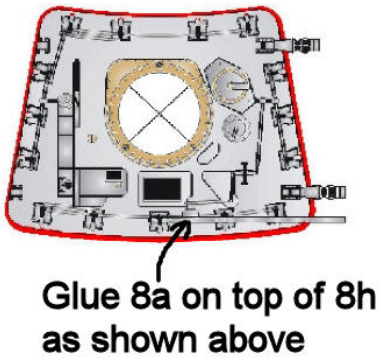
74. Glue the 63/64/65 assemblies into location, in the void made by the addition of part 60 on part 31.
75. Cut out score and fold part 62 into a hand rail.
76. Glue part 62 into position at the top of part 60 using the reference mark on part 60 for the location.
77. Cut out, score and glue into position, three part 59's (Parachutes) around the periphery of part 29/31assembly. *(THIS PART IS NOT FOR POST-FLIGHT VERSION as the chutes have already been deployed).*
78. Glue the part 26/27 heat shield assembly of your choice depending on the version you are building to the bottom of the part 1 cone.
79. Glue part 13 to top of the part 11 cone assembly. This will be a loose-fitting parachute cover for in-flight version displays, (Part 13 may need to be trimmed for a sufficiently loose fit).
80. Loose fit the tunnel hatch assembly (Parts 48 thru 58) for display.
81. Fit and glue the main hatch assembly in the orientation you desire depending on how you wish to display your model.
82. NOTE: Detailed Main Hatch Build, (Should not be attempted by novice builder, (Parts 8a thru 8h)).
    1. Using the inner skin (Part 8) from page 15 and outer skin of your choice, cut out and glue clear, plastic pieces into the openings on the blank, reverse side of the skins to simulate window glass. Note: The inner glass window is round and the outer glass window is square. This is NOT a mistake, but allowed a better angle of view out of the curved hatch.
    2. Using 3 or 4 of the extra outer skin panels (part 7's), sandwich the extra panels between the original inner and outer panels of choice (parts 8 & 7) to create some thickness to the hatch, making sure the extra panels do not interfere with the window glass. Be sure to create the hatch arc before the glue dries to match the curvature of the outer shell of the CM. Once dry, the edges may be colored red with a marking pen depending on personal preferences.



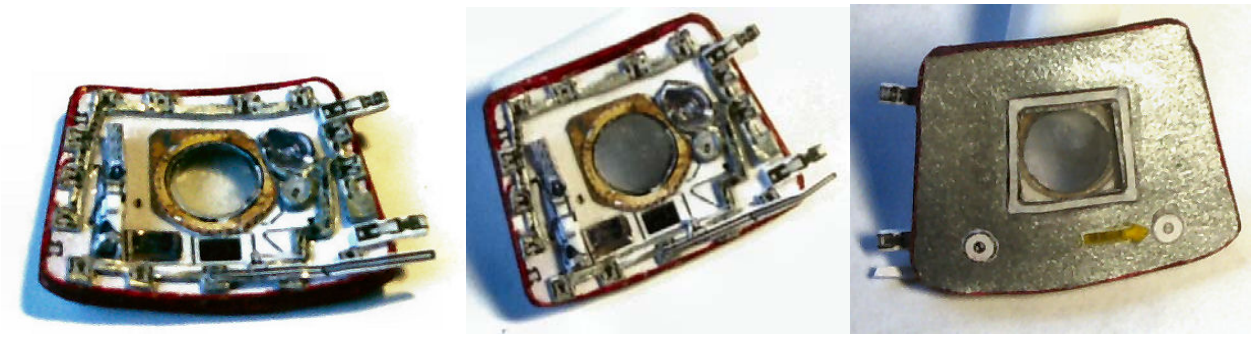
    3. Print Part 8h on thick card stock and CAREFULLY cut out those parts out, removing all white areas before gluing the remaining parts to Part 8.
    4. Cut out two Part 8b (hinges), fold in half, laminate together and glue into place on the right side of Part 8 where indicated.
    5. Cut out, score, fold and glue parts 8c, 8d, 8e and 8g. Place these parts along with Part 8f at locations shown below.



6. Cut out Part 8a, score horizontally, fold and laminate together. Glue on top of the lower portion of Part 8h as shown below.



7. This completes the hatch assembly. Attach the hatch assembly to the left edge of the hatch opening of the outer CM shell.



Enjoy your finished model.
Carl

Rev 3. Added photos and clarified interior assembly instructions. 4/2/07 MHV
Rev 4. Added instructions and detail photos of Hatch Assembly. 4/17/07 MHV