NASA

Astronaut Mae Jemison was the science mission specialist for STS-47 *Endeavour*.

MAE JEMISON

FIRST AFRICAN-AMERICAN WOMAN ASTRONAUT

OBJECTIVES

- Describe Mae Jemison's life before she became an astronaut.
- Describe Jemison's life after she left NASA.
- List some of her accomplishments.
- Build the shuttle *Columbia*.

STANDARDS

NGSS

SCIENCE

- MS-ETS1-1
- MS-ETS1-2
- MS-ETS1-3
- MS-ETS1-4

ELA/LITERACY

- RST.6-8.3
- RST.6-8.9
- SL.8.5
- WHST.6-8.8

NCSS

- IV.f.
- V.c.

Astronaut Mae Jemison became the first African-American woman to go into space in 1992. As historic as that mission was, however, it did not mark the end of her pioneering accomplishments. She has spent almost three decades since the mission on the Space Shuttle *Endeavour* building the future on a number of different fronts:

- Helping to pave the way for the future STEM career force, encouraging women and minorities through educational programs
- Serving on the board of several Fortune 500 companies
- Trying to pave the way for human interstellar travel

The foundation of her own future was built experientially as a child, watching television news broadcasts of Apollo missions and entertainment broadcasts of the science fiction TV show *Star Trek*. After studying at Stanford University in California, and through a career as a physician, medical researcher, engineer, college professor, and Peace Corps volunteer, she was selected into NASA's astronaut program in 1987.

She left NASA in 1993, and in addition to her global real-world accomplishments in higher education, youth education, research, and business, she found recognition in the futuristic fictional world created out of that inspiring show of her youth, *Star Trek: The Next Generation*. She was the first astronaut to appear on the show.

> *"All of science, all of space exploration, everything we do in the world is about imagination and using your creativity to expand beyond your normal boundaries."* **— Mae Jemison**

HER STORY

Born the youngest of three children in Decatur, Ala., on Oct. 17, 1956, Mae Carol Jemison moved with her family to Chicago in 1959 when she was 3 years old, and she considers the city her hometown. Her father was a maintenance worker, and her mother was an elementary schoolteacher. She was interested in science at an early age. She grew up watching the *Apollo* mission broadcasts on television and was upset there were no female astronauts.

"In the 1960s, a lot of people didn't see themselves included in space exploration," Jemison told *Ebony* magazine's Dorothy Givens Terry. People of color are often not seen as pioneers in areas where they actually were pioneers, she continued. "Matthew Henson [Arctic explorer] was there. Lewis Latimer [inventor/draftsman] was there."

Jemison did see a future for herself in science.

"I knew in kindergarten that I was going to be a scientist," Jemison says on her website, DrMae.com. "I also wanted to be a dancer, an architect, and a fashion designer."

Asked who inspired her, Jemison says, "My mother and father, siblings, teachers, uncles and aunts, next door neighbors, and friends, because I knew them day-to-day. Each one of their characters and values taught me something about life. My mother taught me the importance of lifelong learning and intellectual challenge."

Jemison graduated from high school in 1973 at age 16 and received a scholarship to Stanford University. In 1977, she earned a bachelor's degree in chemical engineering and also fulfilled the requirements for a bachelor's degree in African and Afro-American studies. She went on to earn her doctorate in medicine from Cornell University in 1981.

In college, a few professors tried to discourage her career choice, she told *Ebony* magazine in 2012. She cited her parents' support, her love of science, and her confidence in explaining why she continued to pursue science. "I believed I belonged there," she told Terry. "It was a challenge, but I figured I had as much right to do this and I will complete this."

After college, she worked as a general practitioner in Los Angeles until December 1982. For the next two and half years, she served in the Peace Corps as medical officer for Sierra Leone and Liberia in West Africa. In the Peace Corps, she managed the health care delivery system for the Corps and U.S. Embassy personnel, including its medical care, pharmacy, and laboratory. She developed curriculum and taught volunteer personal health training. She also developed and worked on medical research projects. She is fluent in Russian, Japanese, and Swahili.

In 1985, she returned to Los Angeles as a general practitioner while attending graduate engineering classes.

She applied and was selected for NASA's astronaut program in June 1987, one of 15 out of more than 2,000 applicants. She was assigned to launch support activities at Kennedy Space Center in Florida; verification of Shuttle computer software in the Shuttle Avionics Integration Laboratory (SAIL); and Science Support Group activities.

For STS-47 Spacelab-J (September 12-20, 1992), she was the science mission specialist. Jemison flew with six other crew members aboard Space Shuttle *Endeavour* in the cooperative

Continued on PAGE 79

NASA

Achievements include

- Became the first African-American woman in space (1992)
- Inducted into the National Women's Hall of Fame (1993)
- Received the Kilby Science Award (1993)
- Inducted into Texas Women's Hall of Fame (2002)
- Received the National Organization for Women's Intrepid Award (2003)
- Inducted into the International Space Hall of Fame (2004)
- Received Buzz Aldrin Space Pioneer Award (2017)

HER STORY (continued from Page 78)

mission between the U.S. and Japan. The mission made 127 orbits of Earth while its crew conducted 44 Japanese and U.S. life science and materials processing experiments. Jemison was the co-investigator on the bone cell research experiment that was conducted on the mission.

She left NASA in 1993 to teach at Dartmouth College in the area of space-age technology and developing nations.

Soon after, she was back in space of a fictional kind. Actor LeVar Burton asked Jemison to appear on an episode of *Star Trek: The Next Generation* in 1993. She became the first real-life astronaut to appear on the show, set in a TV universe that had originally inspired her pursuit of a career in space. The event was particularly meaningful for her because as a young child, Jemison had been inspired by the character of Lt. Uhura, played by African-American actor Nichelle Nichols, on the original '60s *Star Trek* TV show. Nichols was on hand for the filming. "All of science, all of space exploration, everything we do in the world is about imagination, using your creativity to expand beyond your normal boundaries," she said in a news interview about her appearance on the show.

Also in the early 1990s, she started a non-profit foundation, named after her mother, the Dorothy Jemison Foundation for Excellence, which promotes youth education and science literacy. The foundation's premier program, the Earth We Share, is an international student camp for science literacy.

Her sense of social responsibility was inspired by Linus Pauling, who won the Nobel Prize in 1952 in Biochemistry and again in 1961. She calls him "a scientist who helped me know the importance of exploration and discovery, but also social responsibility."

Another project fueled by her sense of social responsibility that she leads is 100 Year Starship, which describes itself as "a global initiative seed funded through a competitive grant from DARPA [Defense Advanced Research Projects Agency] to ensure the capabilities for human travel to another star within the next 100 years while transforming life on Earth." DARPA's mission is investing in what it sees as "breakthrough technologies for national security."

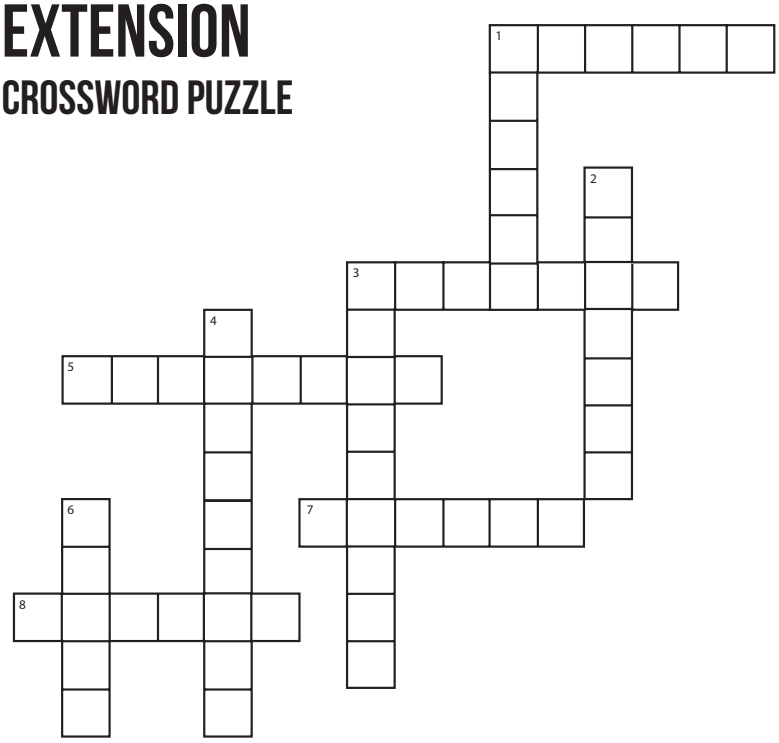
In July 2019, amid the celebrations of the 50th anniversary of the A*pollo 11* mission that put the first humans on the Moon, she posted on social media a glance to the future during the nation's salute to the past.

Her Twitter post on July 21, 2019, read:

> *Clarity: Celebrating Apollo 11 is not just about the past 50 years and the "good old days". It's about what we learned from them and how we use that knowledge, determination and courage to make the next 10, 20, 50 years the "better new days." #LookUp #Apollo50th*

EXTENSION

CROSSWORD PUZZLE



ACROSS

1. Space mission that excited Jemison about the possibility of becoming an astronaut.
3. Birthplace in Alabama.
5. Earned a scholarship to this university.
7. Before becoming an astronaut, Jemison worked as a _____ in Los Angeles.
8. Costarred on *Star Trek: The Next Generation* with him.

DOWN

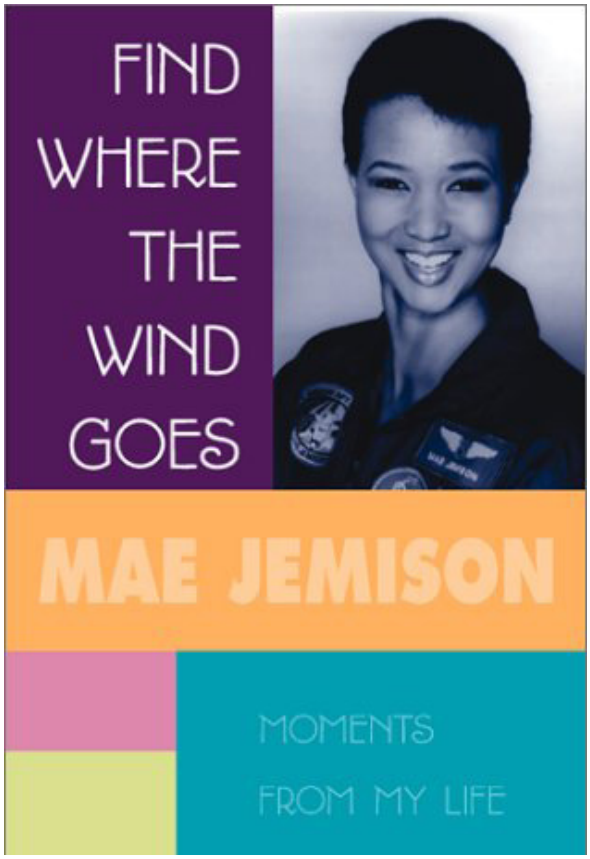
1. Served in the Peace Corps as a medical officer here.
2. Chemist who taught Jemison the value of both scientific discovery and social responsibility.
3. Taught space-age technology at this college.
4. Space shuttle Jemison was a crew member on.
6. *Star Trek* character Jemison admired.

ACROSS: 1. Apollo 3. Decatur 5. Stanford 7. Doctor 8. Burton
DOWN: 1. Africa 2. Pauling 3. Dartmouth 4. Endeavour 6. Uhura

Created using the Crossword Maker on TheTeachersCorner.net.

EXTENSION READ ALOUD

Mae Jemison, the first African-American woman in space, wrote a children's book, *Find Where the Wind Goes: Moments from My Life*. Another children's book about Jemison, *Mae Among the Stars*, was written by Roda Ahmed. Ask students or cadets to read one or both of these children's books to younger students at a school or community gathering.



VIDEO LINKS:

- Mae Jemison – Mini Biography (Biography.com) **https://www.biography.com/video/mae-jemison-mini-biography-2078942717**
- This is how being a dancer makes you a better astronaut (Represented by CNN) **https://edition.cnn.com/videos/us/2019/06/10/mae-jemison-biography-scn-orig.cnn/video/playlists/women-in-space---apollo-sponsorship/**

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HANDS ON

BUILD A SHUTTLE *COLUMBIA*

The Space Shuttle spacecraft were flown from 1981 until the last flight in 1998. The primary use of the Space Shuttle was as a heavy lift reusable vehicle to carry cargo and satellites into orbit. It would then return safely to an airport/airbase to be reused. Mae Jemison, the first African-American woman in space, flew in the *Endeavour*, which launched on September 12, 1992. The Space Shuttle that students and cadets will build is a commemorative model and memorial to the crew of the Space Shuttle *Columbia*, which broke apart during re-entry into Earth's atmosphere in 2003, killing all seven crew members on board.

NASA

BACKGROUND

The term "Space Shuttle" can describe any of the five Space Shuttles that were flown. The Space Shuttle was the world's first reusable spacecraft. It was the first spacecraft to carry satellites to and from orbit. The number of flights made by each shuttle ranged from 10 to 39. The first Space Shuttle was delivered to Kennedy Space Center in 1979. The final shuttle mission landing was on July 11, 2011. The shuttles were given Orbiter Vehicle (OV) numbers. *Columbia* was OV-102.

The Space Shuttle consists of three major components: The orbiter (shuttle), a large external tank, and a set of two solid rocket boosters. The solid rocket boosters and the large external tank provide lift/thrust for the first two minutes of flight. The orbiter and solid booster rockets are reusable, whereas the large external tank burns up on re-entry when it is jettisoned some 2+ minutes into the flight.

NASA's Hubble Space Telescope was carried into orbit by *Discovery* OV-103, and *Endeavour* OV-105 accomplished the first "in space" repair mission of the Hubble Telescope.

The longest shuttle mission was in 1996, when it orbited for 17.5 days (STS-80), but normal missions were usually set at 5-15 days in length. From 1981 until the last shuttle flight 1.36 million pounds of cargo was put into orbit. The shuttles flew 135 orbital missions that spanned over 30 years.

Source: NASA

ABOUT THE SHUTTLE

GENERAL CHARACTERISTICS

- **Crew:** 2-11
- **Length:** 122.17 ft. (37.24m)
- **Wingspan:** 78.08 ft. (23.79 m)
- **Height:** 56.58 ft. (17.25m)
- **Wing Area:** 159.8 ft.^{2} (14.85 m^2)
- **Empty Weight:** 172,000 lb. (78,000 kg)
- **Max Takeoff Weight:** 240,000 lbs. (110,000 kg)
- **Power Plant:** 3 x Rocketdyne Block II SSMEs, each with sea level thrust of 393,800 lbf (1,752 kN) at 104% power.

PERFORMANCE

- **Maximum Speed:** mph (27,870 km/h)
- **Cruise Speed:** 17,320 mph (650 km)
- **Range:** 110-220 miles (204 – 407 km) 28.5 deg. Inclination to LEO and 51.6 deg.
- **Service Ceiling:** 120-600 miles (190-960 km)
- **Operational Orbit Altitude:** 118-596 miles (190-960 km)
- **Orbital Speed:** 17,317 mph (27,870 km/h)

PAYLOAD

- **Maximum Payload:** 55,250 lbs. (25,060 kg)
- **Payload to Landing (Return Payload):** 32,000 lbs. (14,400 kg.)

PROCEDURE — Building the Shuttle *Columbia*

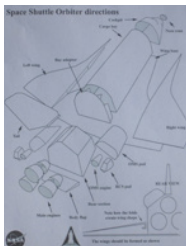
MATERIALS

- Cardstock for templates
- Flat, level, stable, and easily cleaned surface to work on
- Sharp-pointed (X-acto-type) hobby knife; ALWAYS cap it when not in use
- Sharp, precision sewing-type scissors
- A ruler or any other (truly) straight edge
- Toothpicks, round (and flat, if available)
- Aleene's Fast Grab Tacky Glue, Elmer's glue, or super glue
- Eyebrow-type tweezers, having a straight edge of comfortable angle
- Stylus of some kind, to make indented lines for folds
- A trash can nearby to be neat

1 Print the NASA Shuttle plans and instructions on the next four pages.

2 Set up your work area with materials and tools.

3 Read all the instructions on the plan. Delta-7 does not give a lot of step-by-step instructions.



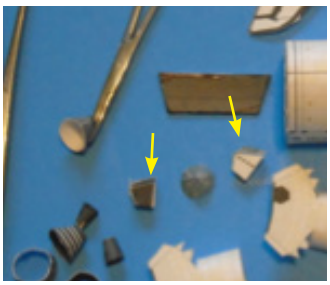
4 Cut out the parts.

5 Score and fold the tabs carefully. Bend tabs with a straight edge ruler. Create sub-assemblies to combine later.

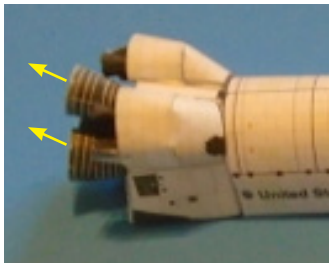
6 Roll and glue the nose cone, OMS engines, and all other engines.

7 Build the cargo bay, cockpit, OMS pods, rear section, body flap, and tail. Make sure the cargo bay is level and flat. The nose and rear sections depend on it being flat so everything will line-up correctly.

8 The rear section has a lot of sub-assemblies. The RCS Pod(s) are small and have a lot of folds, and only two tabs to glue (yellow arrows).



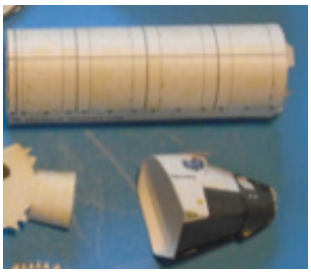
9 Glue the rear section to the bay adaptor. Glue the OMS pods to the rear shuttle. Make sure to glue them on the appropriate sides. Glue the engines to the rear section. The main engines require patience to make the large cones fit into the smaller ones. When attaching they do not thrust straight back, but upward 10-15° (yellow arrows).



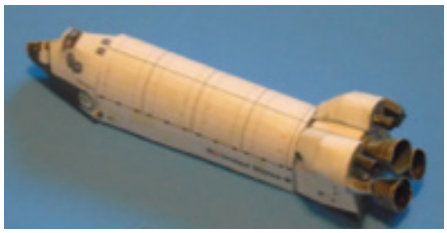
10 Glue the body flap to the rear section under the engines.

11 Glue the OMS engines and RCS pods to each OMS pod.

12 The cockpit section should be put together when the glue is dried on the rear section. Pieces should be fitted to the cargo bay/rear section assembly. It needs to be completely flat for the wings to fit later.



13 Glue the nose cone to the cockpit. Glue the cockpit to the cargo bay assembly.

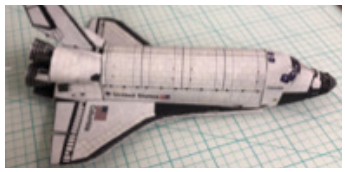


14 Note how the folds create wing shape on the directions page. Fold tabs and glue the wings to the assembly.

15 Glue the wing base to the bottom of the shuttle assembly.

16 Fold the tabs outward on the tail and glue to the top of the rear section assembly.

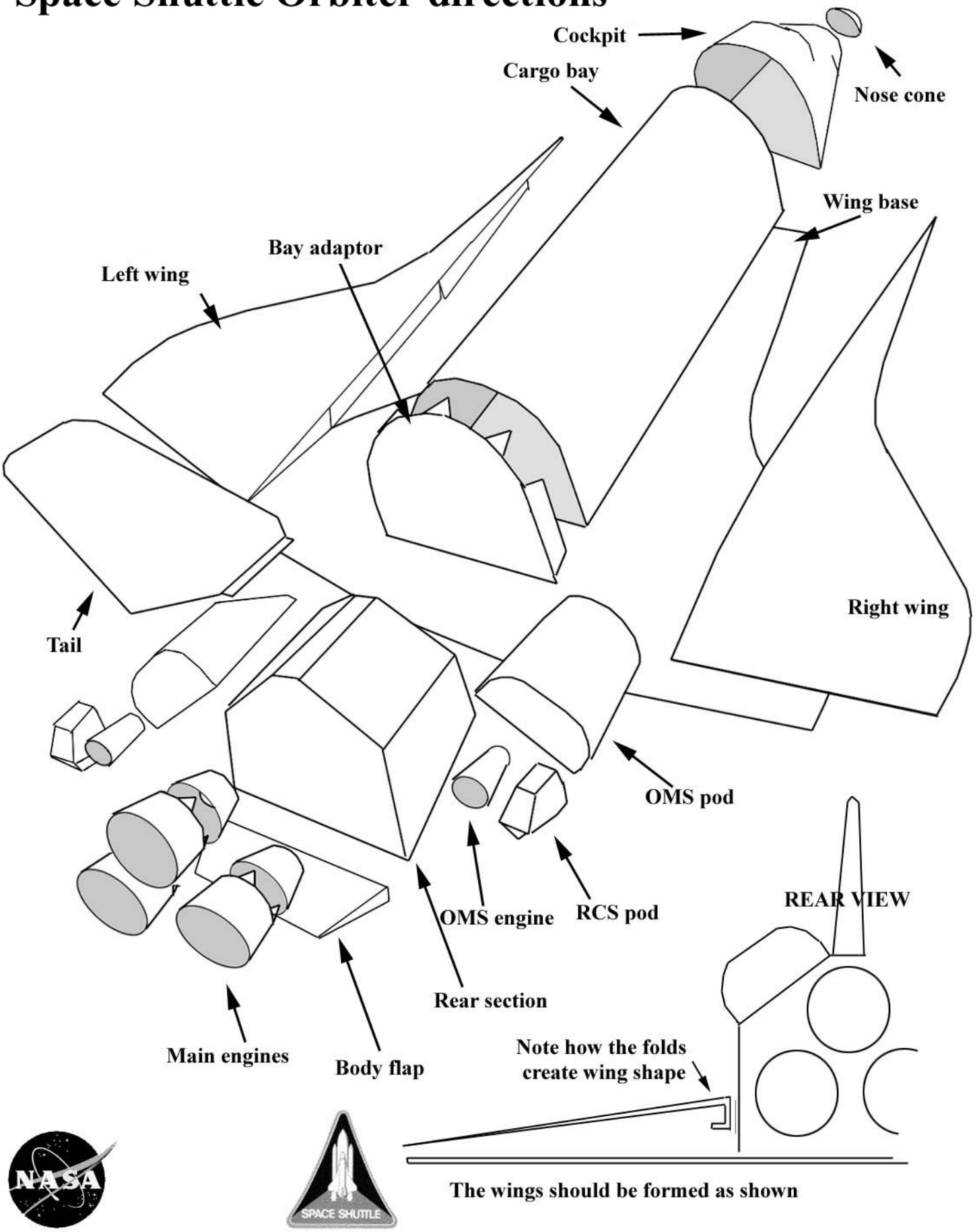
17 Square everything and allow the glue to completely dry.

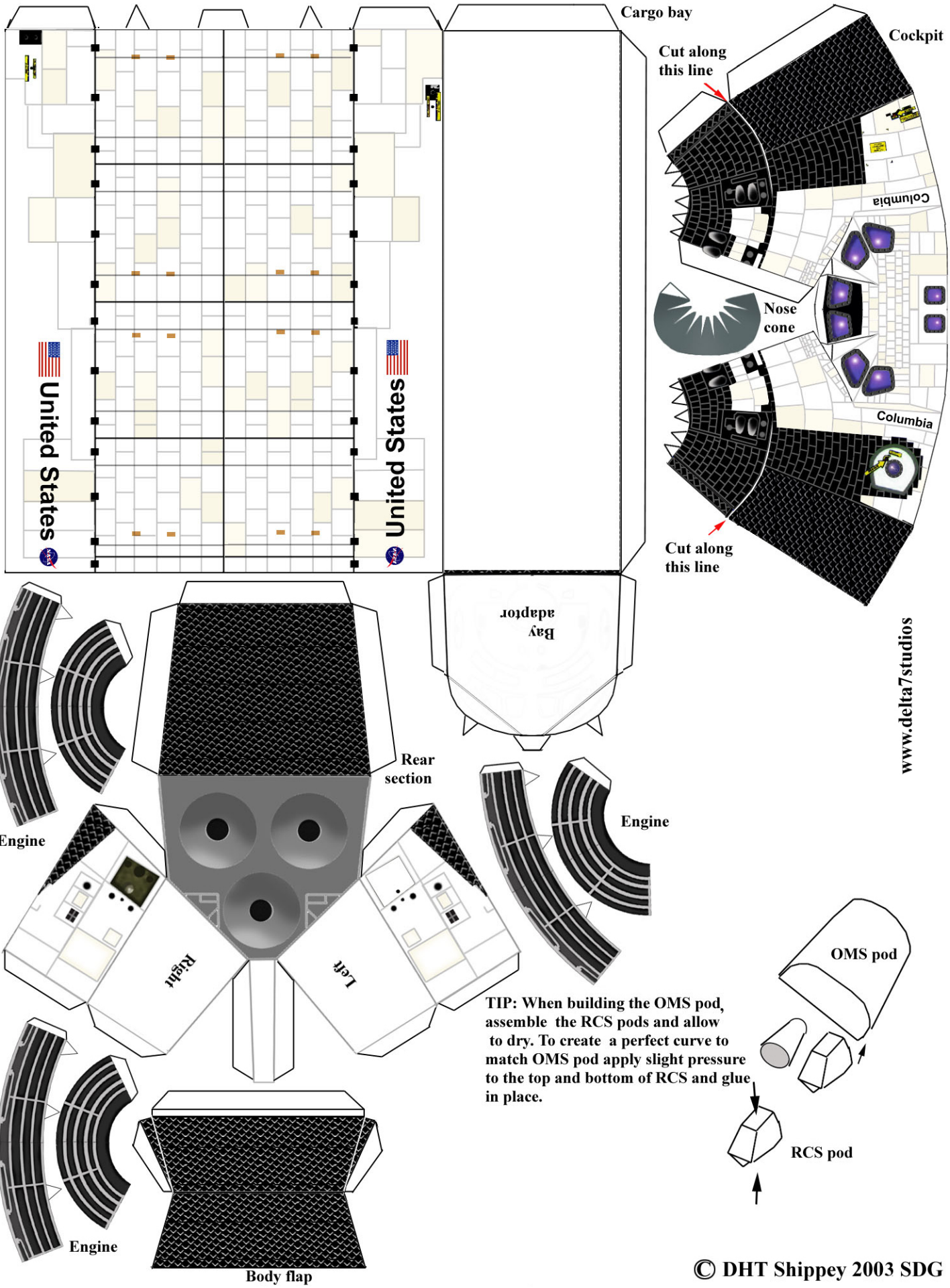


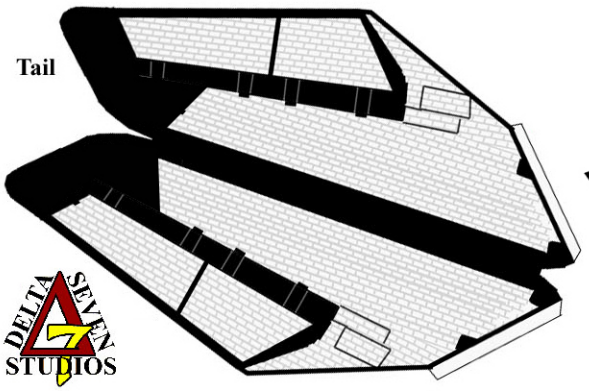
18 Fold and glue the optional base to display your finished Space Shuttle *Columbia* model.

Activity Credit: Credit and Permission to Reprint – Mercury Plan has been given to CAP courtesy of Daniel H. T. Shippey at Delta-7 Studios. His web site **http://www.delta7studios.com/Delta_7_Studios/Free_Models.html** has more activities and suggestions for classroom use. Free model spacecraft and aircraft plans can be found by logging into the Delta 7 Studios web site for educational use.

Space Shuttle Orbiter directions



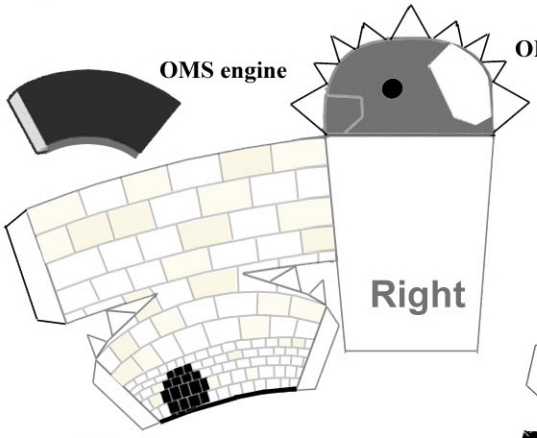

Cargo bay
Cockpit
Cut along this line
Columbia
Nose cone
Columbia
Cut along this line
United States
United States
Bay adaptor
www.delta7studios
Rear section
Engine
Engine
Right
Left
OMS pod
TIP: When building the OMS pod, assemble the RCS pods and allow to dry. To create a perfect curve to match OMS pod apply slight pressure to the top and bottom of RCS and glue in place.
RCS pod
Engine
Body flap
© DHT Shippey 2003 SDG

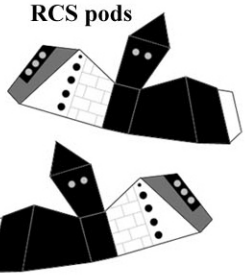


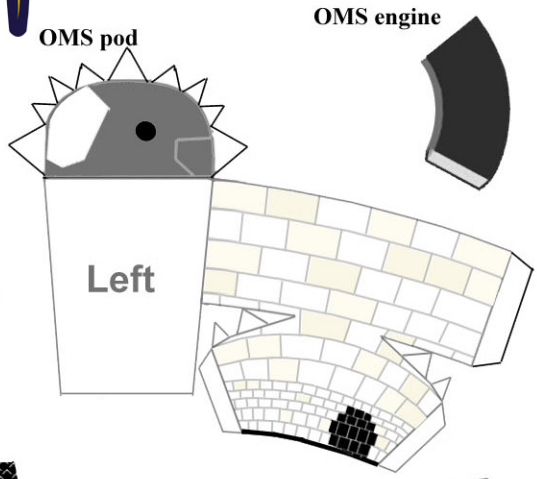
COLUMBIA

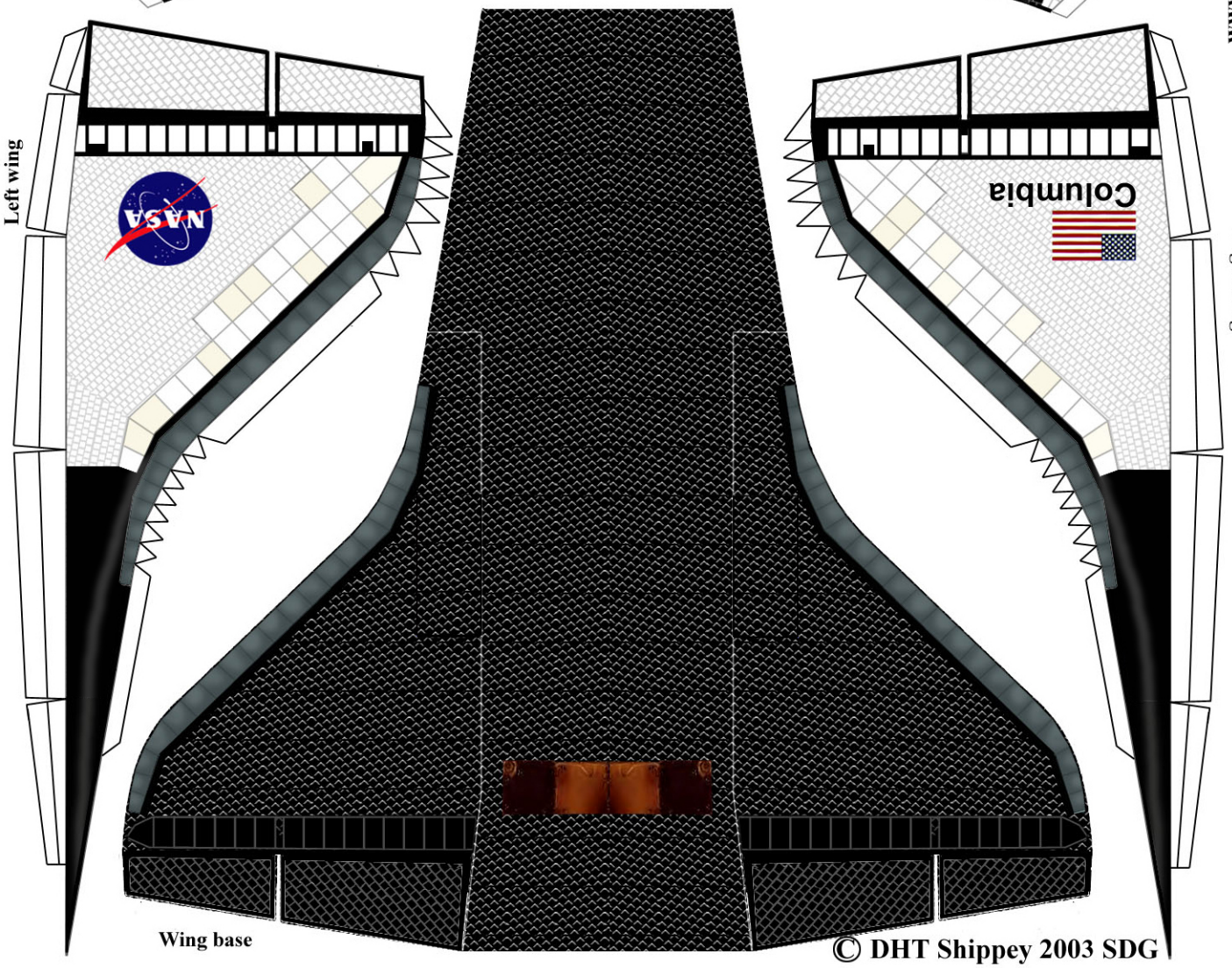
Lost February 1, 2003

Rick D. Husband, William C. McCool, Kalpana Chawla, David M. Brown, Laurel B. Clark, Michael P. Anderson, Ilan Ramon









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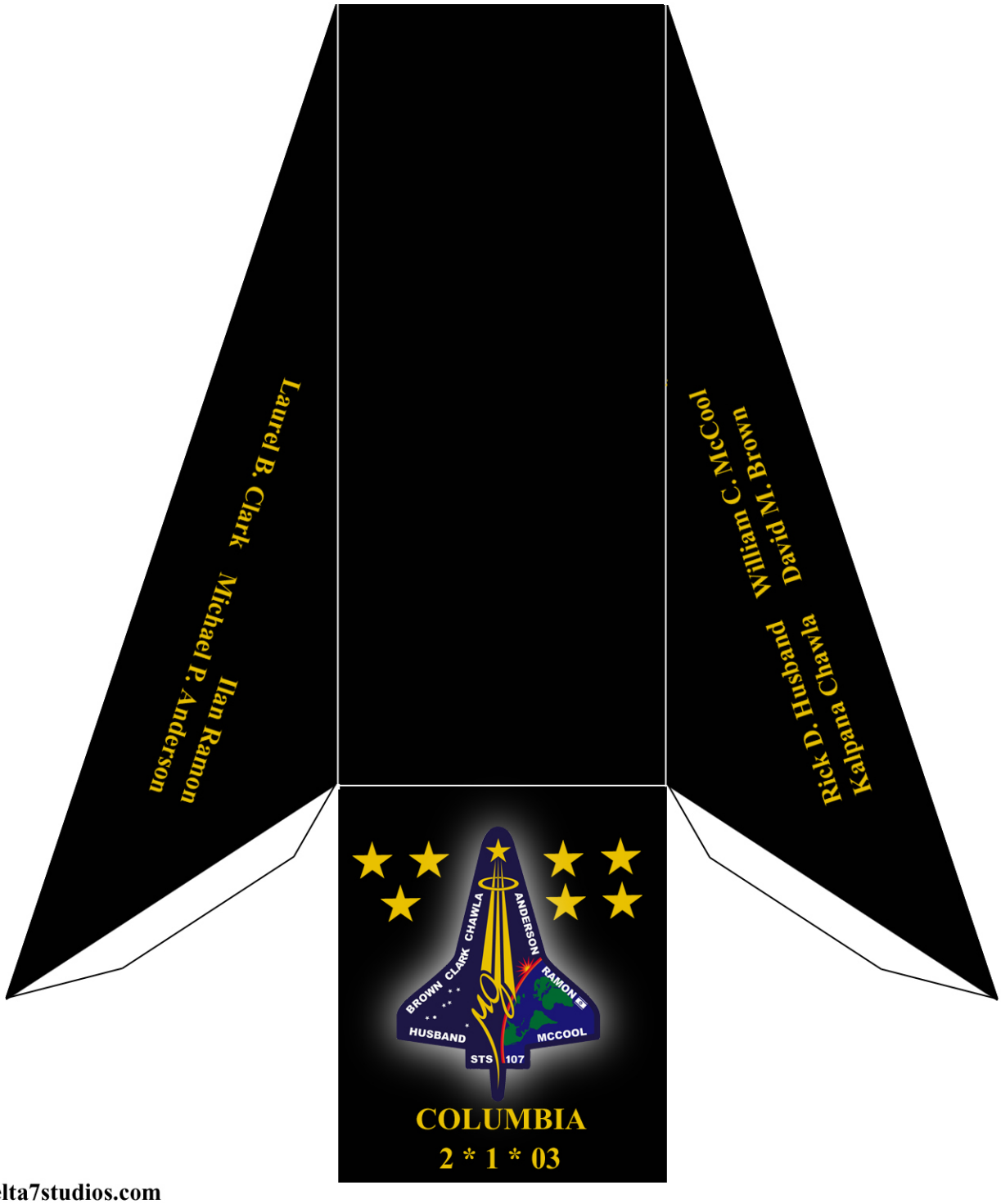
Memorial Base for Orbiter Columbia



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