National Aeronautics and Space Administration

NASAfacts

Constellation Program:

America's Fleet of Next-Generation Launch Vehicles

The Ares I Crew Launch Vehicle

NASA is designing, testing and evaluating hardware and related systems for the agency's Ares I rocket—the vehicle that will carry a new generation of space explorers safely and reliably into orbit.

Under the goals of NASA's exploration missions, Ares I is a chief component of the cost-effective space transportation infrastructure being developed by NASA's Constellation Program. These transportation systems will carry human explorers back to the moon and other destinations in the solar system.

The Ares I effort includes multiple project element teams working at NASA centers and contract organizations around the nation, and is led by the Ares Projects at NASA's Marshall Space Flight Center in Huntsville, AL. Together, these teams are designing and developing vehicle hardware, evolving proven technologies, and testing components and systems. Their work builds on powerful, reliable Saturn and space shuttle propulsion elements, as well as nearly a half-century of NASA space-flight experience and technological advances.

Concept image of launch of Ares I. (NASA MSFC)

Ares I is an in-line, two-stage rocket topped by the Orion capsule, its service module and a launch abort system. The combination of the rocket's configuration and Orion's launch abort system, which can move astronauts away quickly in case of a launch emergency, will improve crew safety.

The launch vehicle's first stage is a single, five-segment reusable solid rocket booster, derived from the Space Shuttle Program's four-segment reusable solid rocket booster, which burns a specially formulated and shaped solid propellant called polybutadiene acrylonitrile (PBAN). A newly designed forward adapter called a frustum will mate the vehicle's first stage to the second, and will be equipped with booster separation motors to disconnect the stages during ascent.

The second, or upper, stage is being designed at Marshall. Much like the upper stage for the Ares V cargo launch vehicle, the Ares I upper stage is propelled by a J-2X main engine fueled with liquid oxygen and liquid hydrogen.

The J-2X is an evolved variation of two historic predecessors: the powerful J-2 upper-stage engine that propelled the Apollo-era Saturn IB and Saturn V rockets to the moon and the J-2S, a simplified version of the J-2 developed and tested in the early 1970s.

Ares I has two missions: lofting up to six astronauts (or cargo) to the International Space Station—approximately 52,000 pounds—or

up to four astronauts to low-Earth orbit for rendezvous with the Ares V Earth departure stage for missions to the moon (56,000 pounds).

During the first two-and-a-half minutes of flight, the first stage booster powers the vehicle to an altitude of about 189,000 feet (36 miles) and a speed of Mach 4.8. After its propellant is spent, the reusable booster separates and the upper stage's J-2X engine ignites and powers the Orion spacecraft to an altitude of about 425,328 feet (80 miles). Then, the upper stage separates and Orion's service module propulsion system completes the trip to a circular orbit of 976,800 feet (185 miles) above Earth.

Once in orbit, the Orion and its service module will rendezvous and dock either with the space station or with the Altair lunar lander and Earth departure stage that will send the astronauts on their way to the moon.

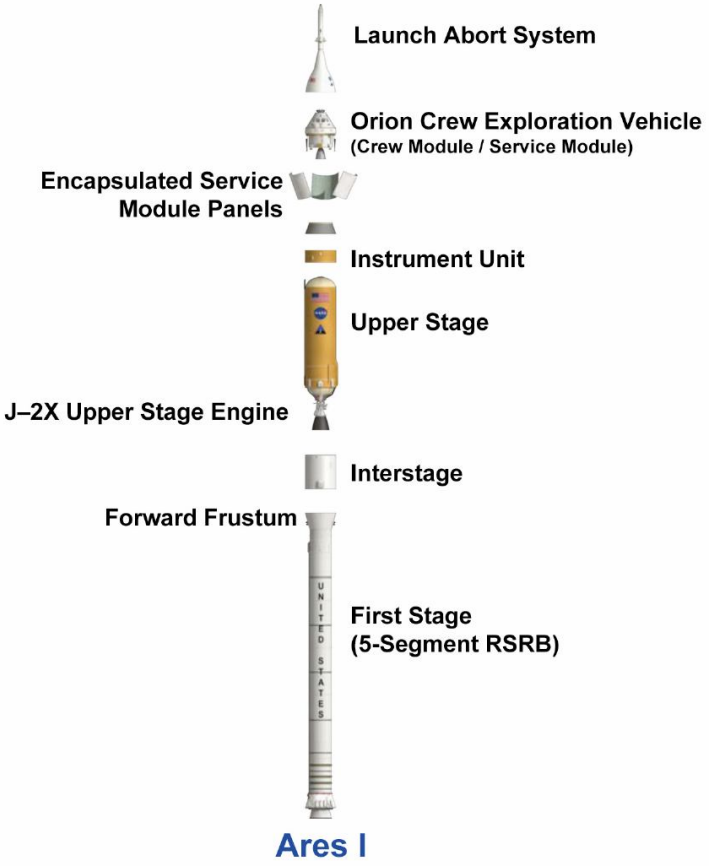
The first Ares I test flight, called Ares I-X, is scheduled for 2009. The first crewed flight of Orion is planned for no later than 2015, with crew transportation to the space station following within the same decade and the first lunar mission scheduled for the 2020 timeframe.

Ares I Team, Partners

The Ares I effort and associated hardware and propulsion element teams are led by the Ares Projects at Marshall, on behalf of the Constellation Program, at NASA's Johnson Space Center in Houston, and NASA's Exploration Systems Mission Directorate in Washington.

Participating agency facilities include NASA's Johnson Space Center, which is responsible for the Orion spacecraft and flight operations projects; Stennis Space Center near Bay St. Louis, Miss., which is primarily responsible for J-2X testing; NASA Glenn Research Center, which is responsible for developing the Ares I-X upper stage mass simulator and Ares I upper stage power, thrust vector control and sensor development; NASA's Langley Research Center in Hampton, Va., which is responsible for Ares I-X flight test vehicle integration and Orion launch abort system development, and for support to flight mechanics and structure development; NASA's Ames Research Center in Sunnyvale, Calif., which is responsible for Ares analysis support, mission and ground operations support, and program systems engineering and integration; NASA's Michoud Assembly Facility in New Orleans, which will manufacture and assemble the Ares I upper stage, the core stage and the Earth departure stage of the Ares V cargo launch vehicle, and the Orion crew exploration vehicle; and NASA's Kennedy Space Center, Fla., which is home toall Constellation launch operations and associated ground activities.

ATK Launch Systems near Brigham City, Utah, is the prime contractor for the first stage. Pratt & Whitney Rocketdyne in Canoga Park, Calif., is the prime contractor for the Ares I upper stage J-2X engine. The Boeing Co. in Huntsville, Ala., is the prime contractor responsible for manufacture and assembly of the upper stage and avionics systems integration and checkout.



National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Huntsville, AL 35812
www.nasa.gov/centers/marshall

www.nasa.gov

FS-2008-11-161-MSFC
8–398517

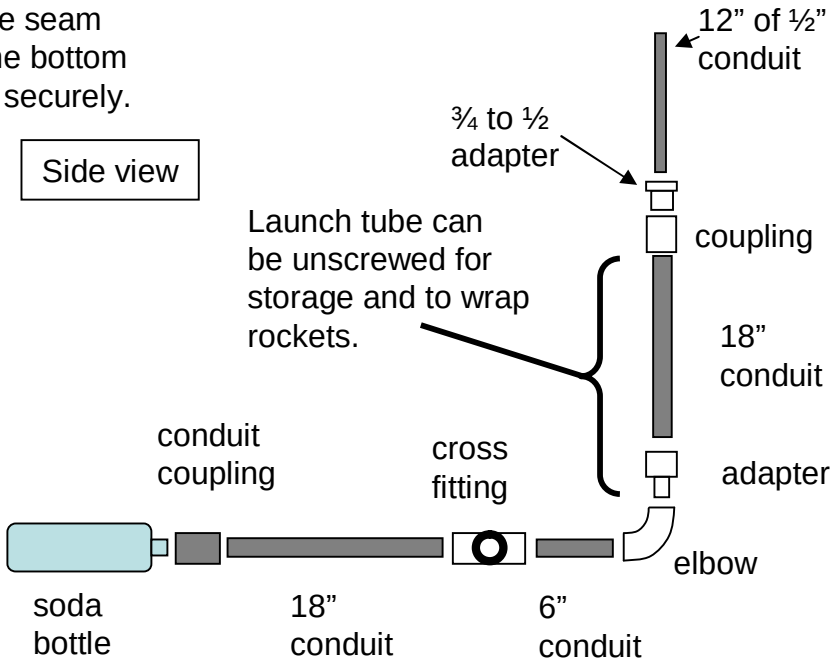
Simple stomp rocket - <$10

Assemble the parts below. Joints can be glued or simply press fit. The grey conduit coupler is more flexible than white PVC and will allow the soda bottle's neck to be jammed/screwed in securely. Neck of the soda bottle can be screwed into the coupling for attachment.

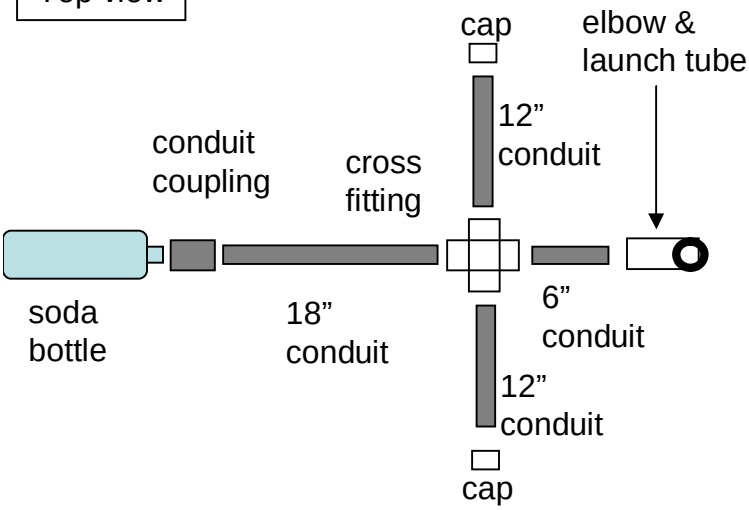
Rockets are made by loosely wrapping a half sheet (4 ¼ x 11) of card stock or construction paper around the removable launch tube and taping the seam lengthwise. Fins are added or cut into the bottom of the tube. Pinch the top shut and tape securely.

Slide rocket over tube and stomp away!

Side view



Top view



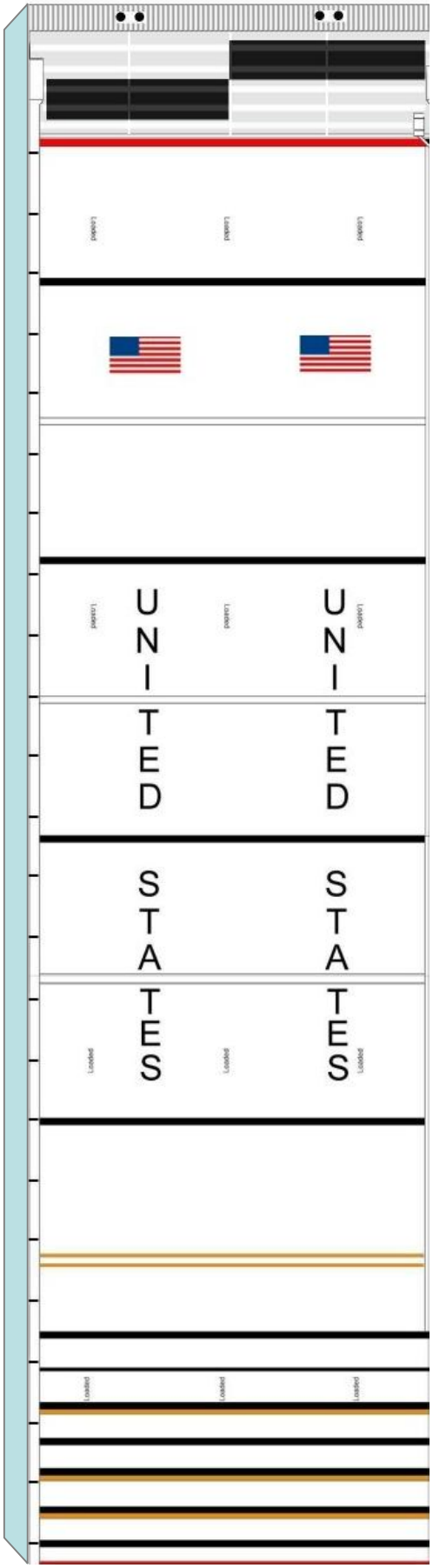
Materials

1	8' of ¾" PVC conduit (uses 5 ½')	$2.00
1	¾" PVC cross fitting	1.70
2	¾" PVC end cap	.72
1	¾" PVC conduit (grey) coupling	.50
1	¾" PVC elbow (slip/female thread)	.53
1	¾" PVC adapter (slip/male thread)	.53

Additional materials for ½" ARES

1 – ¾" PVC coupler	.50
1 – ¾" to ½" PVC adapter	.65
1 – 12" piece of ½" PVC tubing	.25

2 liter soda bottle
Card stock or construction paper
Tape
PVC glue (if desired)



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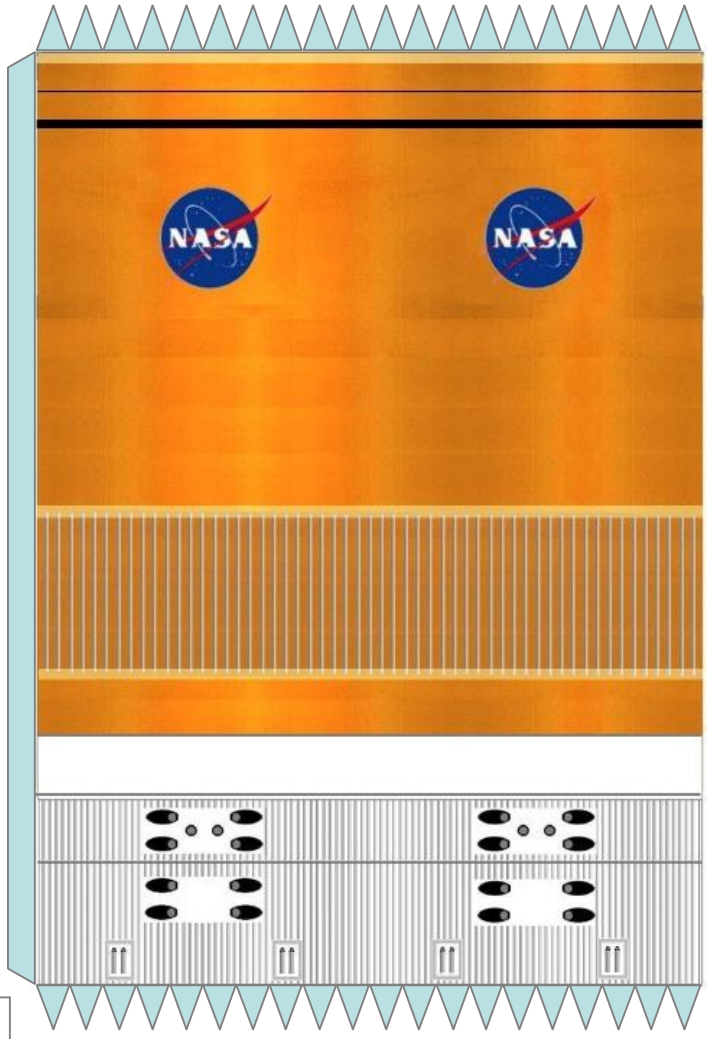

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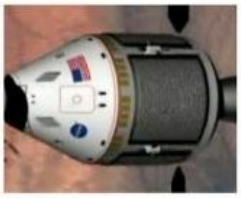

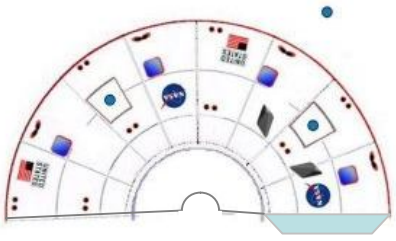

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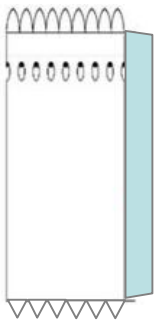

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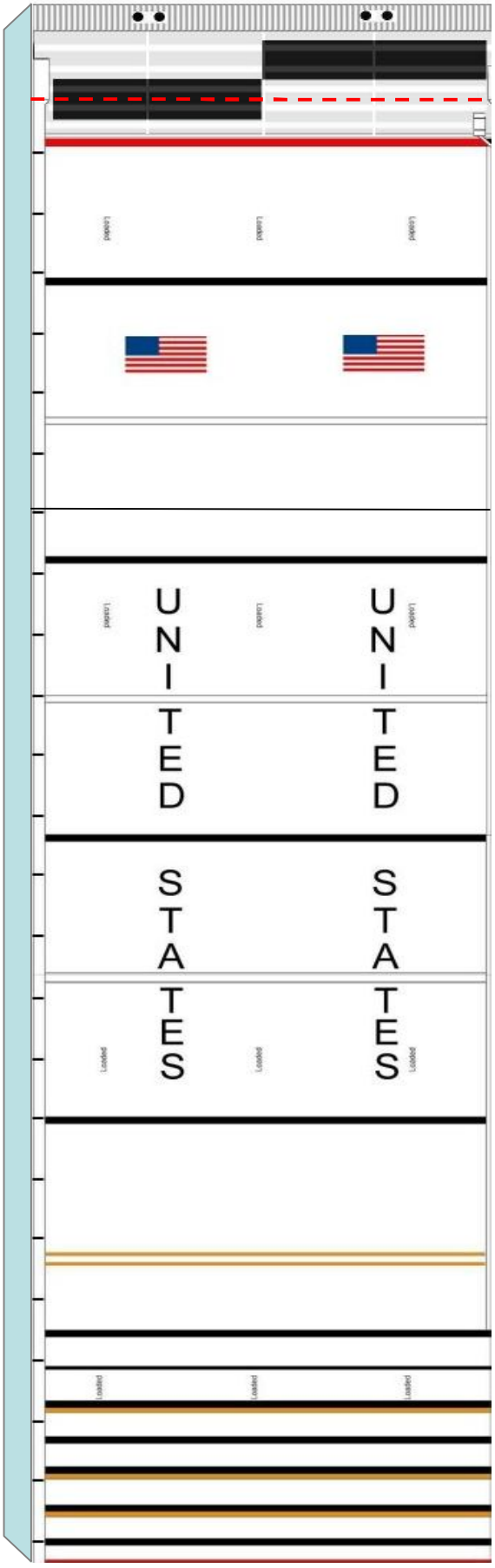
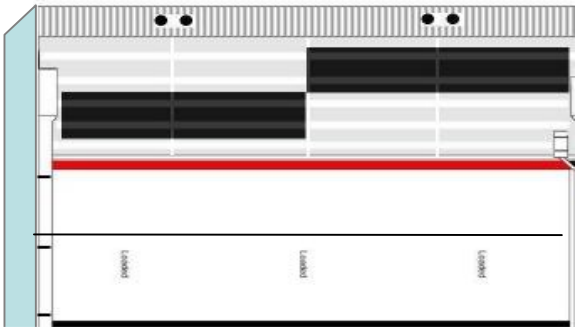
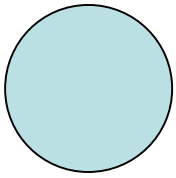
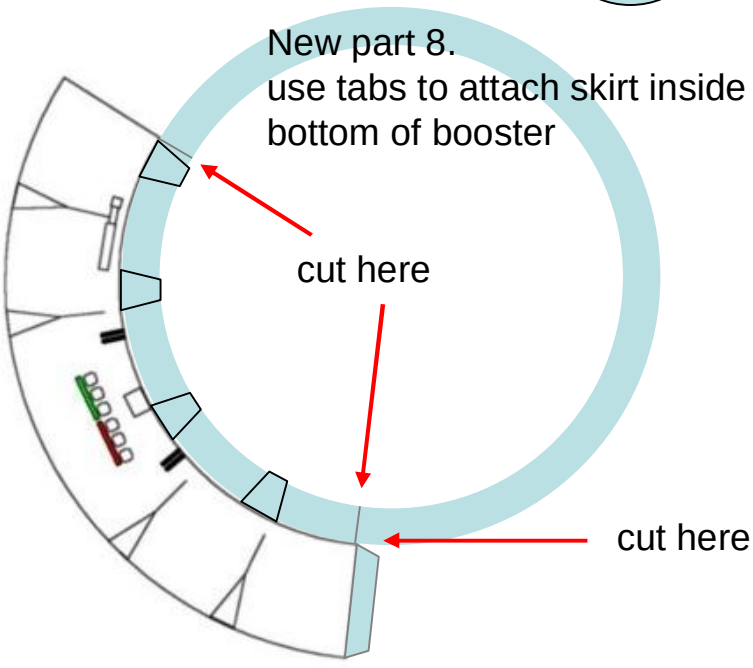
Based on Roland's ARES and launch pad model.
1:210 scale



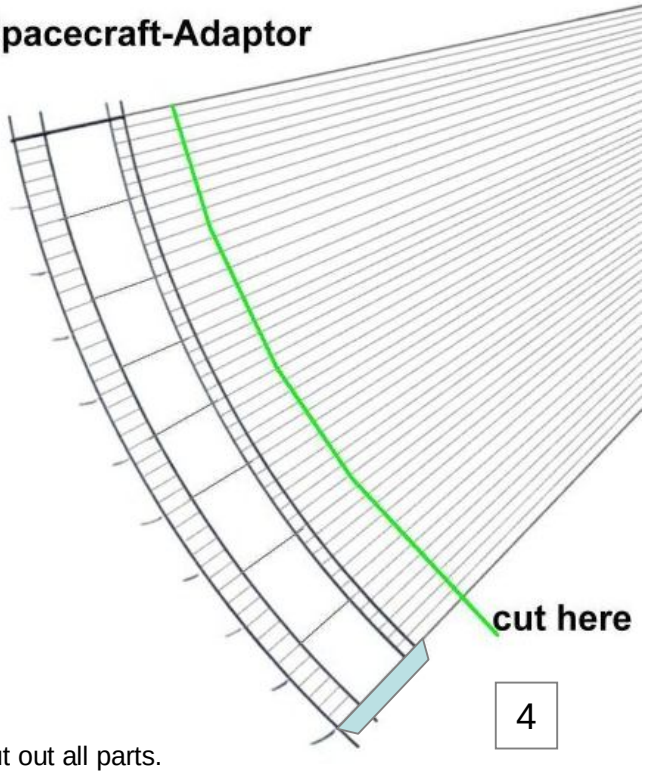


STOMP ROCKET BOOSTER – ROLL LOOSELY AROUND ½” PVC LAUNCH TUBE, THEN CRIMP LEFT PART ABOVE DOTTED LINE (“SHOTGUN SHELL” CRIMP). GLUE CIRCLE (BELOW) OVER CRIMP FOR REINFORCEMENT. USE ABOVE SECTION TO SLEEVE OVER NEW BOOSTER AND THEN JOIN TO PART 6





Spacecraft-Adaptor



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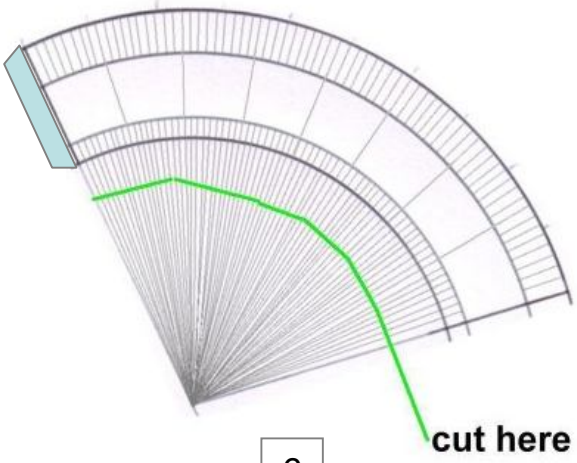
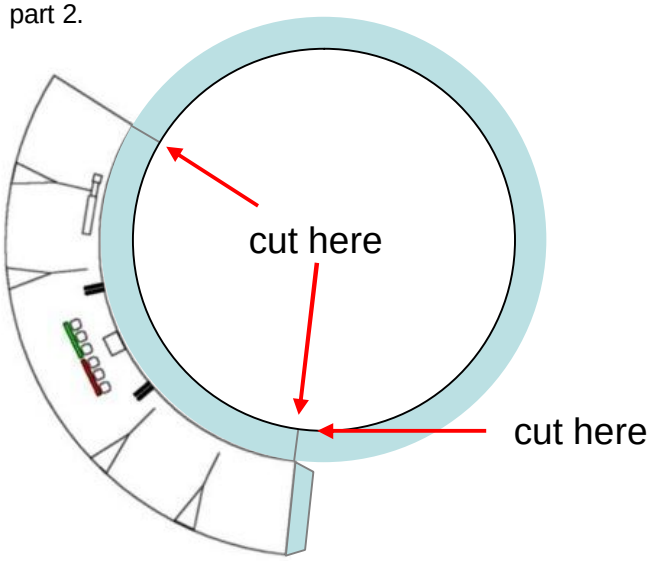
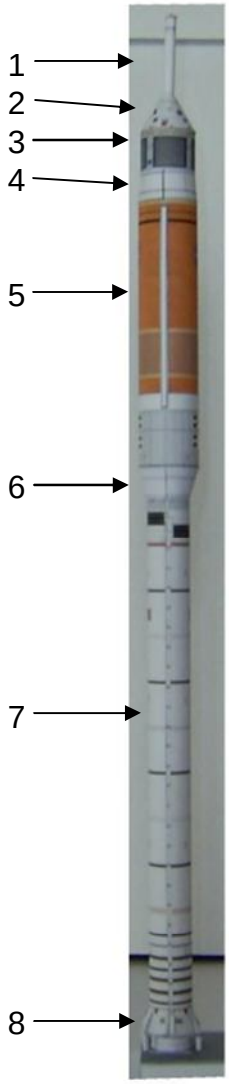


6

Cut out all parts.
Roll parts 1, 3, 5 and 7 into cylinders; secure by gluing the blue tabs.
Roll parts 2, 4, 6, and 8 into cones; secure with the tabs.
Apply glue to the blue shaded area on part 8 and set into the bottom of part 7, ensuring the assembly remains straight.
Bend the triangles at the top and bottom of part 5 inward slightly, apply glue to the triangles. Set the bottom of part 5 into the wide end of part 6. Set the top end of part 5 into the wide end of part 4. Ensure the assembly stays straight.
Bend the triangles at the top of part 3 inward slightly and attach part 2.
Apply glue to the inside of the bottom of part 3 and set down over part 4, ensuring the assembly is straight.
Apply glue to the inside of the top of part 7 and join to part 6.
Bend the triangles at the top of part 1 inward to close the top and secure.
Bend the ovals at the bottom of part 1 outward and secure over the point of part 2.





Based on Roland's ARES and launch pad model.
1:210 scale

8

Keeping the joint seams on opposite sides helps keep things round.

Basic ¾” caliber stomp rocket.

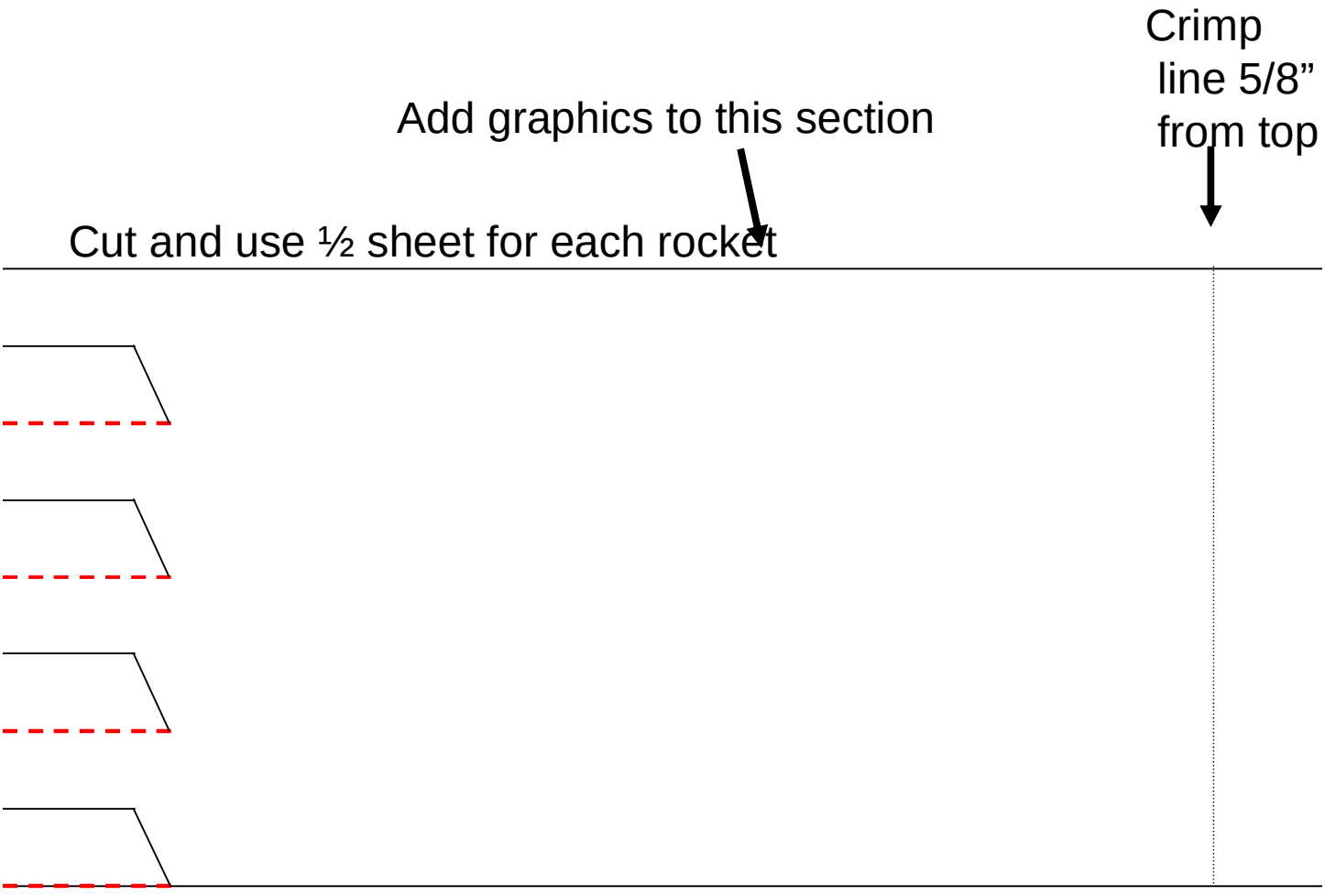
Half sheet (either way) of letter sized paper or card stock.

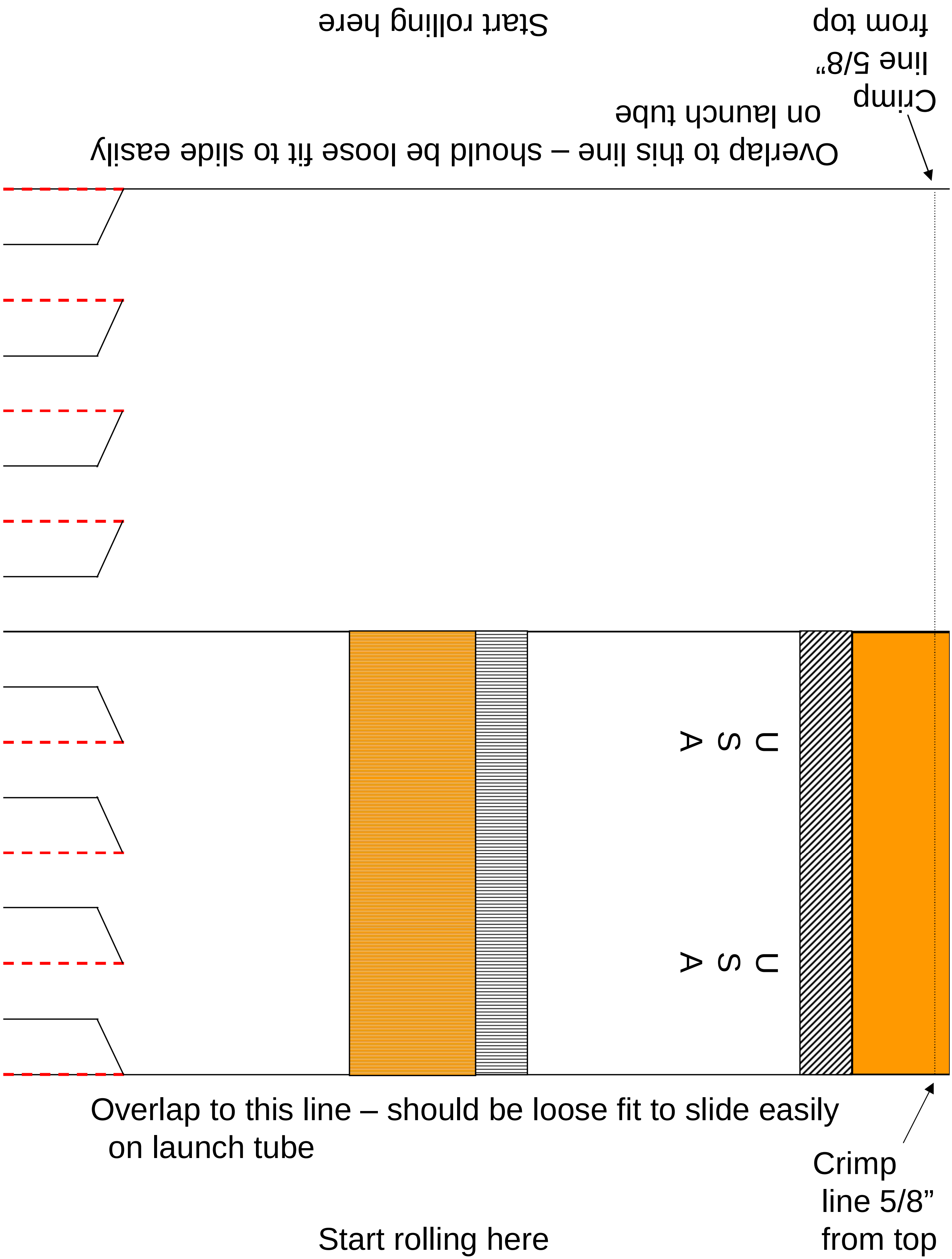
Roll loosely around ¾” launch tube and tape seam.

With rocket on the launch tube, crimp the top shut at the dotted line and tape securely. You can glue on a reinforcing disk or nose cone if desired – not required.

Cut out and fold fins at bottom after assembling the rocket tube – cut on the solid black and fold on the red dotted lines. Or, cut separate fins and tape/glue in place.

Place on ¾” launch tube and stomp away.




Overlap to this line – should be loose fit to slide easily
on launch tube
Crimp
line 5/8”
from top
Start rolling here
U
S
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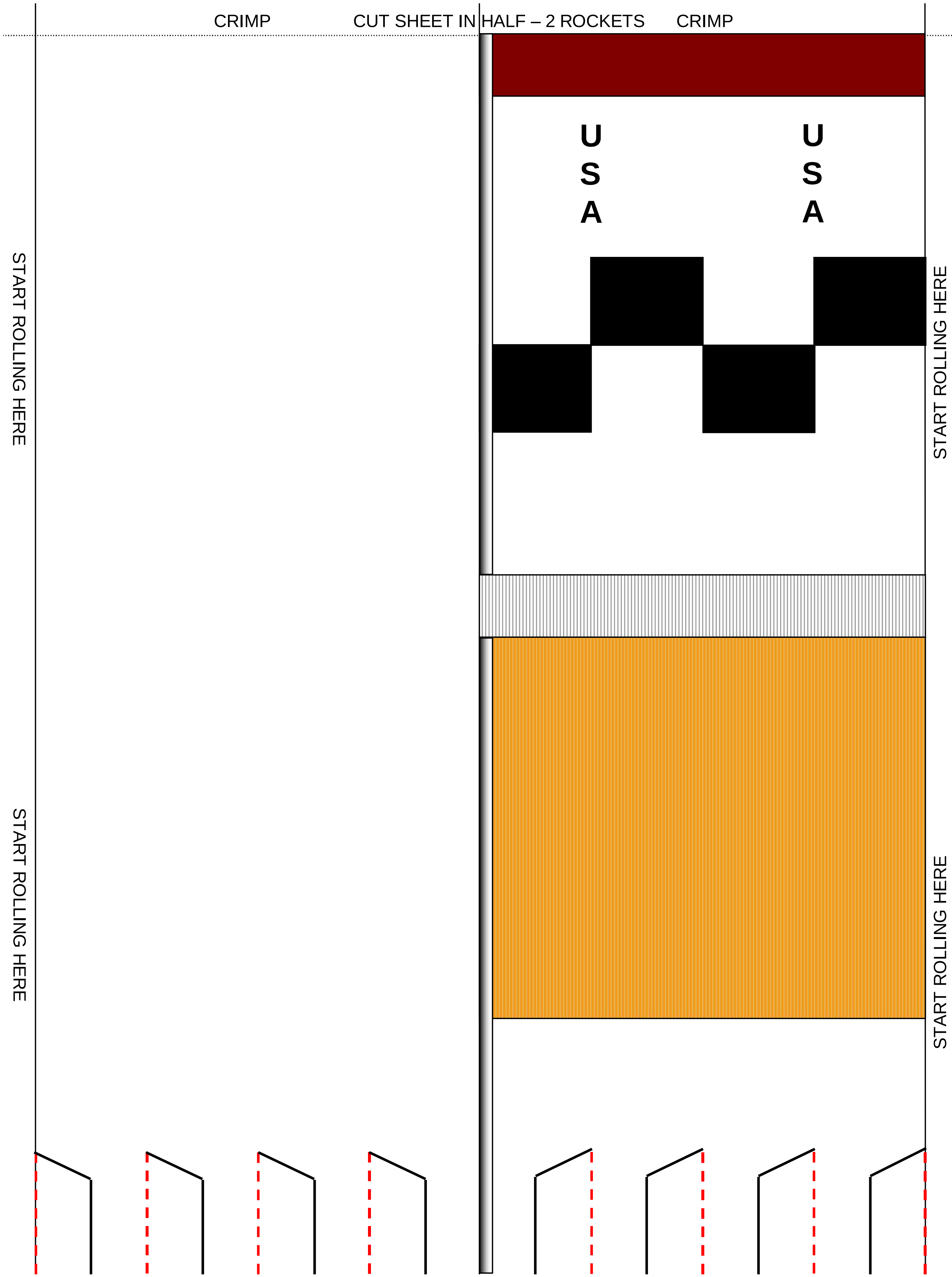
CRIMP
CUT SHEET IN HALF – 2 ROCKETS
CRIMP
START ROLLING HERE
START ROLLING HERE
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