
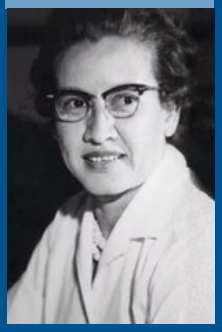




WOMEN IN AVIATION

VOLUME TWO






PRODUCED BY

THE CIVIL AIR PATROL

AEROSPACE EDUCATION
DIRECTORATE

On June 18, 1983, Sally Ride became the first American woman to fly in space when the Space Shuttle *Challenger* launched on mission STS-7.

SALLY RIDE

FIRST AMERICAN WOMAN IN SPACE

OBJECTIVES

- Describe Sally Ride's early life before she became an astronaut.
- List some of Ride's accomplishments where she was the first.
- Describe some of her accomplishments outside of NASA.
- Build the Leasat SYN-4.

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.6-8.7
- WHST.6-8.8
- WHST.6-8.9

NCSS

- IV.f.

Astronaut Sally Ride knew the significance of her first Space Shuttle mission in 1983. To the fascinated nation, the most compelling aspect of the seventh shuttle flight, *Challenger*, was that it would send the first American woman into space. Ride was that trailblazer.

"The fact that I was going to be the first American woman to go into space carried huge expectations along with it," Ride said in a 2008 interview commemorating the 25th anniversary of the mission. "That was made pretty clear the day I was told I was selected as a crew [member]. I was taken up to [Johnson Space Center Director] Chris Kraft's office. He wanted to have a chat with me and make sure I knew what I was getting into before I went on the crew. I was so dazzled to be on the crew and go into space I remembered very little of what he said."

Ride had been among the first group of American women selected to be astronauts in 1978.

Her first trip to space was as a mission specialist, and in 1984, she returned as a mission specialist on *Challenger* for STS 41-G, this time with another woman as a crew member, Kathryn Sullivan, marking the first space flight to include two women.

Ride was the only person to sit on both investigative boards for the shuttle catastrophes of *Challenger* in 1986 and *Columbia* in 2003.

After she left NASA in 1987, she wrote several children's books on space and was dedicated to promoting STEM education in elementary and middle schools, especially for young girls.

Despite her pivotal role in history, she never wanted to be in the spotlight, protecting her privacy. She died in 2012 at age 61 after a 17-month battle with pancreatic cancer. She had asked NASA not to publicize her illness.

HER STORY

Sally Kristen Ride was born in Encino, California, near Los Angeles on May 26, 1951, as the oldest of two daughters. Her father, Dale B. Ride, was a political science professor, and her mother, Carol Joyce Anderson Ride, was a counselor at a women's correctional facility. Ride credits them for nurturing her interest in science and exploration.

She graduated from Westlake High School for Girls in 1968. After attending college at Swarthmore College in Pennsylvania and the University of California, Los Angeles and considering a career in tennis, she enrolled in Stanford University as a junior. At Stanford, she was a nationally ranked singles tennis player. Women's tennis star Billie Jean King urged her to quit college for tennis. Instead, Ride stayed at Stanford, where she earned bachelor's degrees in physics and English in 1973, a master's in physics in 1975, and a doctorate in astrophysics in 1978.

NASA began looking for women astronauts in 1977, and Ride answered an ad in the school newspaper. She was one of the first six women selected as a NASA astronaut candidate in 1978, part of the first class of astronauts for the Space Shuttle program. Although her appointment to be the first woman in space was groundbreaking, the attention was not all positive. Media asked her such gender-biased questions as "would she wear makeup in space?"

She was chosen for the 1983 STS-7 Challenger mission because she was known for keeping her cool under stress but, also, because of her experience with robotics. As a mission specialist, her job was to use a robotic arm to put satellites into space. Ride was also a mission specialist on *Challenger* STS 41-G in 1984, a mission which also deployed satellites. She was scheduled to make another flight before the *Challenger* exploded on Jan. 28, 1986. After that, the program was suspended, and she retired from NASA in 1987.

Ride served as a member of the panel appointed by President Ronald Reagan to investigate the *Challenger* accident. She was asked again to sit on a similar panel after the 2003 *Columbia* disaster. She is the only person to serve on both committees.

After her retirement from NASA in 1987, she became a science fellow at the Center for International Security and Arms Control at Stanford. In 1989, Ride joined the faculty at the University of California, San Diego as a Professor of Physics and Director of the University of California Space Institute.

In 2001, she founded Sally Ride Science to motivate girls and young women to pursue STEM careers. Her friend, journalist and biographer Lynn Sherr, noted in *Parade* magazine that Ride was committed to "the advancement of women in all fields" and had "determination to keep girls interested in math and science."

Ride wrote several science books for children, such as *To Space and Back* and *Voyager: An Adventure to the Edge of the Solar System*.

Continued on PAGE 97

NASA

Achievements include

- Was first American woman in space (1983)
- Was a crew member on two Space Shuttle missions (1983, 1984)
- Awarded the NASA Space Flight Medal (1983)
- Awarded The Lindbergh Eagle (1985)
- Inducted into National Women's Hall of Fame (1988)
- Received the Von Braun Award (1995)
- Inducted into Astronaut Hall of Fame (2003)
- Received the National Collegiate Athletic Association (NCAA) Theodore Roosevelt Award (2005)
- Inducted into the National Aviation Hall of Fame (2007)
- Presented the Presidential Medal of Freedom, posthumously (2013)
- Inducted into Women in Aviation International Pioneer Hall of Fame (2014)
- U.S. Navy commissioned research ship, *Research Vessel Sally Ride* (2016)
- Featured on a U.S. postage stamp (2018)

> *"The thing that I'll remember most about the flight is that it was fun. In fact, I'm sure it was the most fun I'll ever have in my life."*
>
> **— Sally Ride**

NASA

On June 15, 1983, three days before launch aboard Space Shuttle *Challenger*, Sally Ride takes a last look at Houston before taking off in a T-38 jet for Kennedy Space Center in Florida.

NASA

Ride, STS-7 mission specialist, displays the tools she uses on the mid deck of the Space Shuttle *Challenger*.

HER STORY (continued from Page 96)

In 2011, Sally Ride Science and NASA installed cameras on the International Space Station. This EarthKAM project allows middle school students to request photographs of Earth. The name stands for Earth Knowledge Acquired by Middle School Students.

Sherr, the biographer and journalist who had covered Ride, memorialized her with these words: "Sally's ride 30 years ago changed our world, and she never stopped trying to make it better—for us, and for our children."

The driving force for Ride's advocacy of girls in science careers was "the sense that a lot of the stereotypes about girls and science and math that we all assumed would be gone by now, have not gone away," Ride said. "Eleven-year-old girls still aren't encouraged quite as much as 11-year-old boys about science and math. A girl might still feel negative pressure from her peers if she's the best one in the math class. Yet, research shows that girls enjoy science as much as boys throughout elementary school. It's in the middle-school years that they start to drift away. And that's partly because of peer pressure."

In August 2019 on Women's Equality Day, Mattel toys unveiled a Sally Ride Barbie as part of a collection of historic, trailblazing women that also includes Katherine Johnson and Amelia Earhart. The company announced its driving force was research that showed many girls are less likely than boys to see their gender as smart.

It was Ride's advocacy for STEM education, particularly STEM education for young girls, that President Barack Obama cited at the news of her death. "She inspired generations of young girls to reach for the stars and later fought tirelessly to help them get there by advocating for a greater focus on science and math in our schools," President Obama said in a statement. "Sally's life showed us that there are no limits to what we can achieve."

NASA

Ride and her fellow astronauts from STS-7 were joined by NASA and Air Force officials to greet NASA Dryden employees in 1983, after her historic Space Shuttle mission.

MATTEL

Mattel introduced the Sally Ride Barbie® in 2019 to its Inspiring Women™ Series.

QUICK BOX

Overcoming Barriers

In 1984, at age 32, Sally Ride was set to become the first U.S. woman in space. Before her first Space Shuttle mission, reporters asked her a string of tough questions focused on her gender. Would spaceflight affect her reproductive organs? Did she plan to have children? Did she cry on the job? Would she wear makeup in space? Johnny Carson, the host of "The Tonight Show," joked that the flight would be delayed to let Ride find a purse to match her shoes.

At a NASA news conference, Ride said: "It's too bad this is such a big deal. It's too bad our society isn't further along."

Source: The New York Times

EXTENSION RESEARCH AND WRITING

1. Sally Ride founded the EarthKAM (Knowledge Acquired by Middle school students) project for middle schoolers. During Sally Ride EarthKAM missions, or periods when the EarthKAM camera aboard the International Space Station is operational, middle school students around the world request images of specific locations on Earth. The missions operations center for the program is located at the U.S. Space and Rocket Center in Huntsville, Alabama.

2. Have your youth register to participate in this program. For more information, visit **https://www.earthkam.org/**.

3. Sally Ride wrote several children's books explaining science topics for children. Ask your students or cadets to select a scientific topic and write a children's book that explains this topic to young readers.

www.earthkam.org

VIDEO LINKS:

- Sally Ride: Breaking the Highest Glass Ceiling (Smithsonian National Air and Space Museum) **https://www.youtube.com/watch?v=Dsgz-b-Tebo**
- Sally Ride Remembers Her Shuttle Flight (Space.com) **https://www.youtube.com/watch?v=wojiv4AhD4g**

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BUILD THE LEASAT SYN-4

Students and cadets will build highly detailed paper models of an important communications satellite that helped make the use of worldwide communication possible. Sally Ride used a Space Shuttle robot arm to launch a similar communications satellite (TDRS-3). The iPhone is a direct descendant of the hardware that this satellite made possible decades ago. These satellites (Leasat F1 – F4) were designed to be launched by the Space Shuttle missions flown from 1981-1985. The primary original user was the U.S. Navy, but the technology paved the way for the use of cell phones to communicate worldwide.

NASA

BACKGROUND

The U.S. Navy's Leased Satellite (Leasat) system consisted of five Syncom IV satellites. The U.S. Congress in the mid-1970s decided there was a need for instant worldwide Department of Defense (DoD) communications that could only be achieved by having a network of relay satellites to handle UHF and SHF communications needs. Specifically, the DoD and naval fleets/bases spread around the globe needed to be connected. In 1978, contracts were given to Hughes Communications Services (later merged into Boeing) to build five satellites (one a spare), with the Space Shuttle, launching them from orbit.

The robotic arm on the Space Shuttle was designed around this need. The idea was to have a commercial company design, build, and operate satellites that would be leased by the DoD, saving money in the long run.

The principal users of this satellite constellation were all the U. S. armed forces air, land, and sea. It also included mobile air, surface, subsurface, and fixed earth stations. There were 4 ground stations and 2 mobile ground stations, as well. For once, there was a communications system that all of the DoD users could use anytime they needed it.

Boeing defines the satellites as "spin-stabilized, with the spun portion containing the solar array, sun, and Earth sensors for attitude determination and Earth pointing reference, batteries for eclipse operation, and all propulsion and attitude control hardware. The de-spun platform contains Earth-pointing reference, batteries for eclipse operation, and all propulsion and attitude control hardware. The de-spun platform (also) contains Earth-pointing communication antennas, communication repeaters, and the majority of the telemetry, tracking, and command (TT&C) equipment." (Boeing.com)

Leasat-4 (Syncom-4 4) was put into orbit by Columbia F9 (STS-32R) in 1985. All of the Leasat satellites had been decommisioned by 2015. Currently the Leasat program has been superseded by a new constellation of Hughes Communications UHF Follow-On (UFO) satellites. (Boeing.com)

ABOUT THE SATELLITE

GENERAL CHARACTERISTICS

- **Crew:** None
- **Overall Height:** 20ft.3 in. (6.17 m)
- **Diameter:** 14 ft. (4.26 m)
- **Empty weight:** 172,000 lb. (78,000 kg)
- **Weight on Shuttle:** 17,000 lb. (7,711 kg)
- **Weight in Orbit:** 3,060 lb. (1,388 kg.)
- **Power plant:** 2 x liquid motors to transfer satellite from Space Shuttle orbit (180 miles, 296 km) to it's the final parking orbit

PERFORMANCE

- **Operating Altitude:** 22,300 miles (35,744 km) in a geosynchronous orbit
- **Life Expectancy:** 7-years in orbit
- **Solar Panel Output:** 1238 watts plus 3-25 A-hr nickel-cadmium batteries

COMMUNICATIONS PAYLOAD

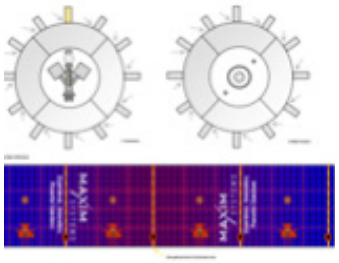
- **2-UHF Antennas:** 240-400 MHz
- **13-UHF channels**: 1-500 KHz wide band
- **SHF Band:** 7250 – 7500 MHz and 7975 – 8025 MHz
- **12-UHF Repeaters**

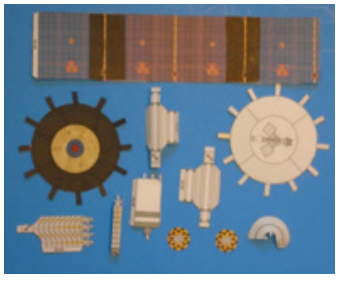
PROCEDURE — Building the LEASAT SYN-4

MATERIALS

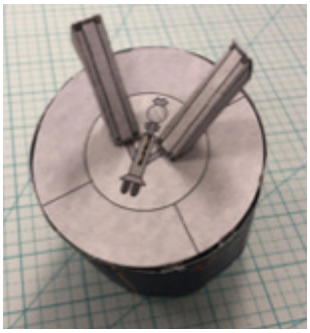
- Cardstock for templates
- Flat, level, stable, and easily cleaned surface to work on
- Sharp-pointed ("X-acto"-type) hobby knife; ALWAYS cap it when not in use
- Sharp, precision sewing-type scissors
- A ruler or any other (truly) straight edge
- Toothpicks, round (and flat, if available)
- Aleene's Fast Grab Tacky Glue or 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
- Small hobby clamps or straight hemostats
- Highlighters/markers to color in areas

1. Print the instructions on copy paper and plans on cardstock.
2. Set up work area with materials and tools.
3. Read all the instructions. Niels Knudsen, the designer, included instructions to tell where to glue, cut, and fold/bend. Follow these instructions on the next page.
4. The plan has an advertisement for something. A black/dark blue marker can be used to color both sides where the "Maxim" advertisement is. This will not detract from the satellite model. Some solar panels are a very dark color.





5. Cut out the parts, slowly and carefully.
6. Roll and glue Side Solar Cell Surface.
7. Glue Top Surface to the Side Solar Cell Surface. Make sure to glue the gold tab to the center line of the Side Solar Cell Surface and that it is on the side closest to the end of the line with the black box.
8. Attach the Bottom Surface to the opposite end of the Side Solar Cell Surface.
9. Roll and glue Rear Thruster. Glue to center of Bottom Surface indicated by striped circle.
10. Fold and glue the Antenna Support Arms forming a trapezoid. Glue the smaller side tabs first, then glue the long tab.
11. Glue each Antenna Support Arm to the Top Surface on the striped squares.



12. Roll and glue the Omni Antenna. Fold in the single glue tab and glue inside cylinder to create the top. Fold the remaining three tabs on the bottom out and glue to the striped circle on the Top Surface.
13. Fold and glue the UHF Antennas forming a trapezoid. Glue the smaller side tabs first, then glue the long tab. Glue each triangular tab to the adjacent triangle forming a point.
14. Glue each UHF Antenna to a UHF Cone on the designated striped box.
15. Glue each UHF assembly to the top end of the Antenna Support Arms. Make sure they each point downward and are perpendicular with the body of the satellite.

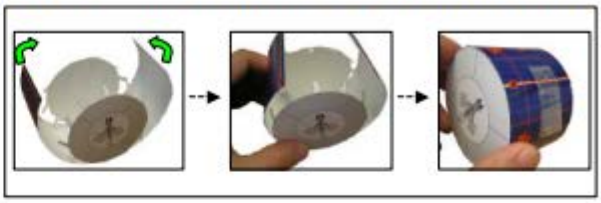
Activity Credit: Credit and Permission to Reprint – Niels Jahn Knudsen, of **www.nielspapermodels.com/index.html** has graciously provided in the public domain permission to reprint many of the paper model plans at his website. One such plan is presented here. Additionally, there are several hundred different satellite/rocket 3-D models that can be downloaded (free).

ASSEMBLY INSTRUCTIONS: LEASED SATELLITE (LEASAT)

This satellite project is recommended for advanced model builders and may take several hours to build. Requires scissors, white glue, and transparent tape.
For Best Results: Print on cardstock and score each dotted line and glue tab (gray arrows <---) with a sharp knife to ensure they fold easily and straight

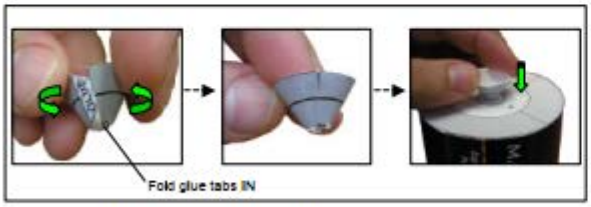
Step 1: Body Assembly

- Roll Side Solar Cell Surface (3) into a cylindrical shape to make body assembly easier
- Glue gold colored tab on Top Surface (1) to center line of the Side Solar Cell Surface (3) making sure it is glued on the side closest to the end of the line with the black box A
- Attach Bottom Surface (2) to the opposite side of Side Solar Cell Surface (3) using any tab with the printed side facing outward



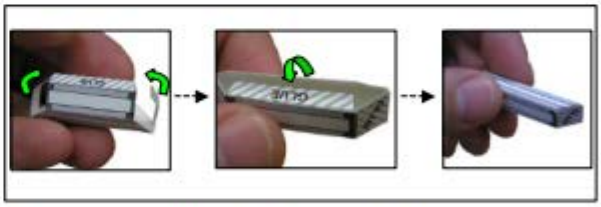
Step 2: Body Assembly - Continued

- Alternate gluing tabs of the Top and Bottom Surface (1 and 2) to the Side Solar Cell Surface (3), moving away from your starting tabs and letting each dry before moving on to the next set
- For the last five or six tabs on each end, place glue on all the tabs at once, and carefully role the cylinder shape closed, as shown
- Place glue on the large tab of the Side Solar Cell Surface (3) to complete the cylinder shape, and use transparent tape to hold it closed



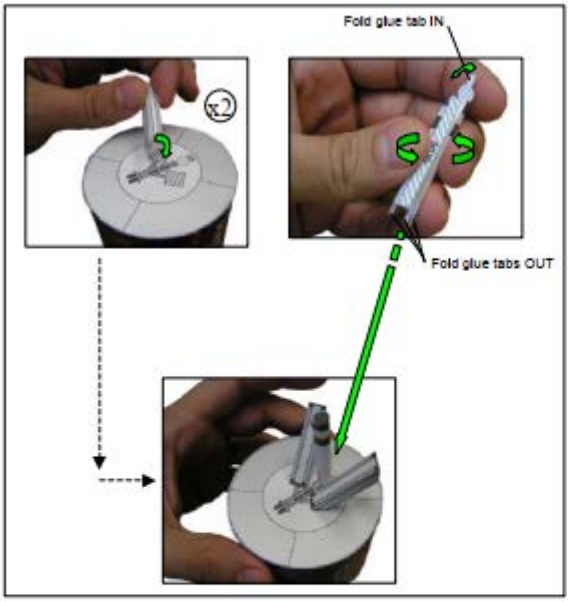
Step 3: Rear Thruster Assembly

- Fold and glue Rear Thruster (8) into conical shape as shown with bottom glue tabs folded inward
- Glue to center of Bottom Surface (2) on the satellite body as shown placing the Rear Thruster on to the stripped circle



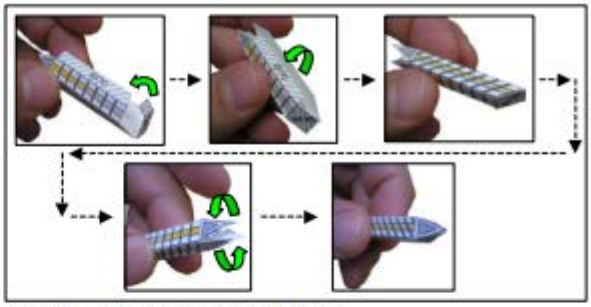
Step 4: Antenna Support Arm Assembly (x2)

- Fold and glue each end of the Antenna Support Arm (5) inward to the opposing side of the piece, forming the trapezoid shape shown
- Glue the final side down to the remaining glue tab
- Repeat all steps for the other Antenna Support Arm (5)



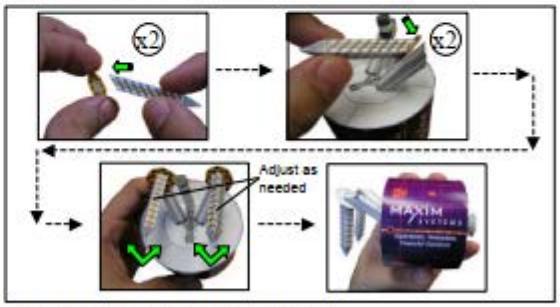
Step 5: Support Arm Attachment/ Omni Antenna Assembly and Attachment

- Glue each completed Antenna Support Arm (5) to the Top Surface (1) as shown on the stripped squares
- Prepare the Omni Antenna (4) by rolling the flattened piece around a small pencil, or other thin round object, to form a cylinder shape
- Glue the Omni Antenna to itself, forming the completed cylinder, fold in the single glue tab at the end, and glue down the round gray colored top piece
- Fold the three tabs on the opposite end out, and glue the Omni Antenna to the Top Surface (1) as shown, on to the stripped circle



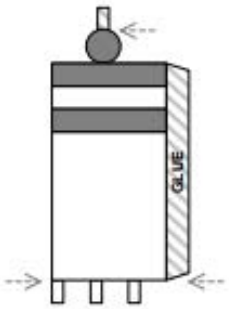
Step 6: UHF Antenna Assembly (x2)

- Glue end of UHF Antenna (7) tab inward to the opposing side of the piece
- Glue the remaining side to the long glue tab to complete the main shape
- On the opposite end of the antenna, bend each small tab on the gray triangular pieces inward, and glue it to the adjacent triangle, forming a point
- Repeat all steps for the other UHF Antenna (7)



Step 7: UHF Antenna Attachment

- Glue each UHF Antenna (7) to a UHF Antenna Cone (6). When dry, glue each assembly to the top end of the Antenna Support Arm (5) as shown
- As each assembly starts to dry, adjust its position so it points straight down and is perpendicular with the body of the satellite itself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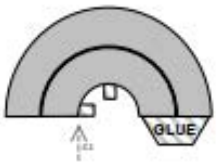
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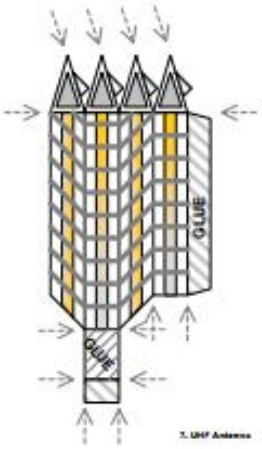
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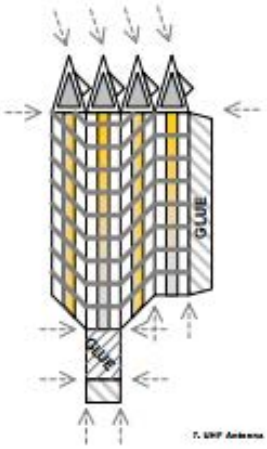
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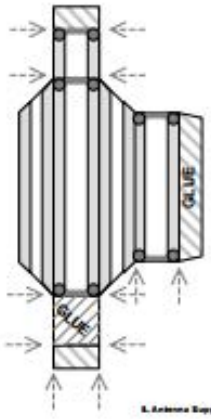
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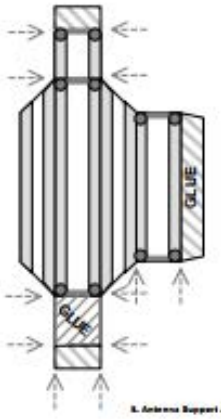
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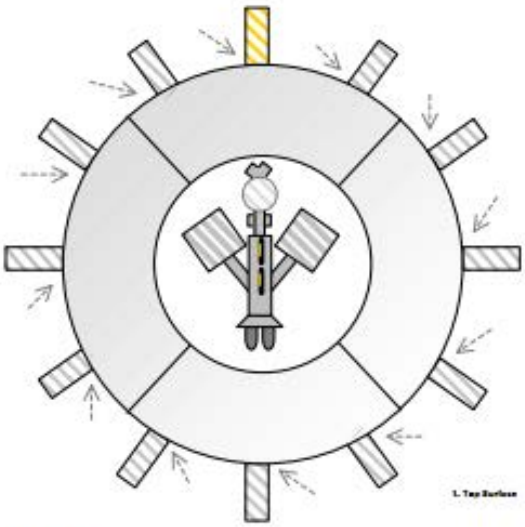

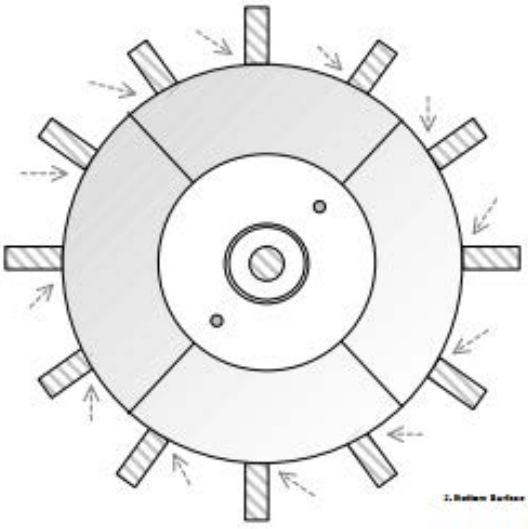

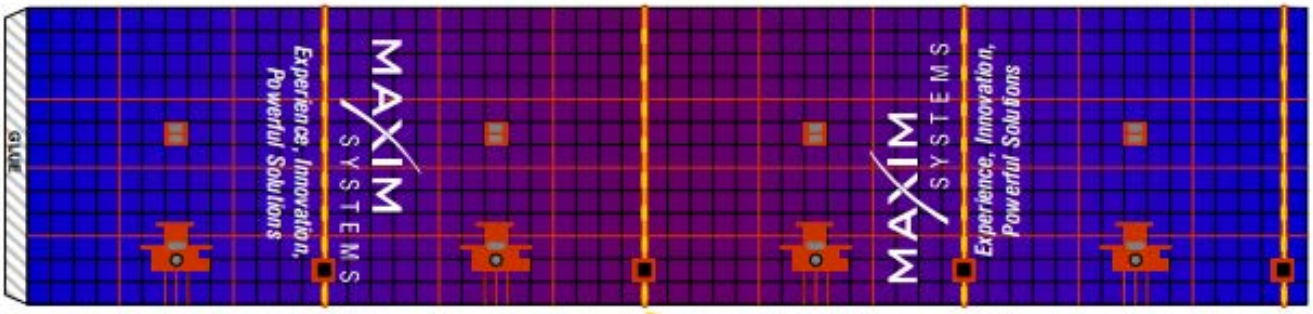
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