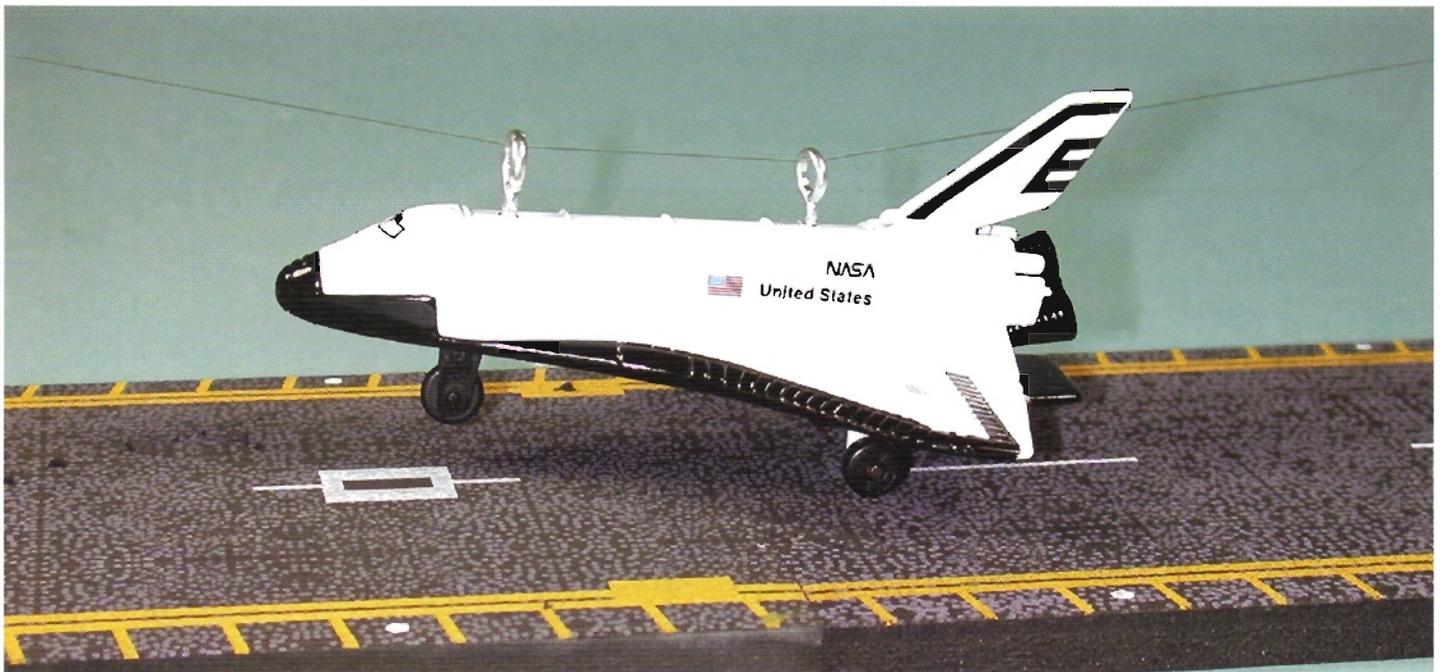


activity seven

Land The Shuttle — Back From Space!

OBJECTIVE – The object of this fun activity is to “fly” a toy airplane down a long nylon fish line and to land it on a simulated runway in front of a “pilot,” holding a joystick! Sound crazy? It works, it’s cheap, and it’s fun for everyone, adults and kids!



BACKGROUND

Back in the Seventies, a toy known as “U FLY IT™,” was produced by a company called Cootie Manufacturing. It was a very “basic” little simulator. Creation of this activity was inspired by Cootie’s U Fly It™ toy.

Here’s how it works: One end of a long piece of fishing line is tied to a little wooden stick. This becomes the “pilot’s joystick.” The opposite end of the fish line is positioned so that it is approximately 10 feet away and maybe 5 feet higher than the pilot’s joystick. A toy airplane, like the one shown in the lead photo, is equipped with two eye screws mounted on the top of the fuselage. These eye screws are easily obtained at any hardware or home repair center and are mounted in the position as shown in the photograph.

A little “runway” can be made with tape, and laid out on a

table top ahead of the pilot. [The Hot Wings™ runway also works very well]. When the pilot gives the signal, the person, at the other end, holding the little airplane releases it and lets it slide down the fish line.

As the plane slides down the line, it gathers speed. The object is for the pilot to land the “Shuttle” as it “returns from space as a glider.” If the pilot pushes forward on the stick, the line slackens and the airplane picks up more speed. If the pilot isn’t careful, the little plane will land short, or undershoot, the runway. If the pilot pulls back too much, the airplane will overshoot the runway and hit the joystick. After a little practice, the pilot learns how to “fly” the airplane and make it land to a full stop on the runway [like the one at Edwards Air Force Base in California or the Kennedy Space Center in Florida].

ROCKET SCIENCE

Teaching children about how the Shuttle comes back from a space mission

- When a Shuttle mission is complete, the astronauts prepare for the return trip. First the Shuttle Commander fires smaller maneuvering rocket engines to position the craft so that it faces forward. This starts the procedure known as re-entry, or leaving orbit. The Shuttle has heat-resistant tiles on its underside and they act as shields during re-entry. Temperatures can reach as high as 2,500°F while inside (cabin) temperatures are comfortable for the crew. In preparation for landing, the crew dons their “gravity pants.” These are built so they will keep the blood flow balanced and to prevent the crew from “black-ing out.”
- The Shuttle drops an astonishing 125 miles in approxi-mately 30 minutes. The Shuttle’s plasma wake causes communication problems and several computers are re-quired to maintain the desired speed and descent angle.
- Because the Shuttle has no “landing engines,” it is a glider when it re-enters the atmosphere.
- The commander actually flies the Shuttle like a conven-tional airplane once the air is dense enough to make the control surfaces work.
- The angle of descent, as it approaches the runway, is seven times as steep as one would experience on a jet airliner.
- When it touches down, the Shuttle is doing 200 miles per hour.
- The rear tires touch first followed by the nose gear.
- To bring it to a stop, a parachute is deployed.
- To this date, there never has been a major accident in landing the Shuttle—only one blown tire and that was on mission STS-51D!



Two 1/16ths holes are drilled in the back of the Shuttle. They should both be slightly off-center so that the fish line will clear the tail. Notice the size of the eye screws compared to the size of the Shuttle.



Here you can see how the eye screws are installed. Notice that the front eye screw has a slight opening in its loop. This is a desirable feature and you can do this with a hack or jeweler’s saw. It makes it easier to attach.

NATIONAL STANDARDS

Science Standards:

- Standard A: Science as Inquiry
 - Abilities necessary to do scientific inquiry
 - Understanding about scientific inquiry
- Standard B: Physical Science
 - Position and motion of objects
- Standard G: History and Nature of Science
 - Science as a human endeavor
 - Unifying Concepts and Processes
 - Evidence, models, and explanation

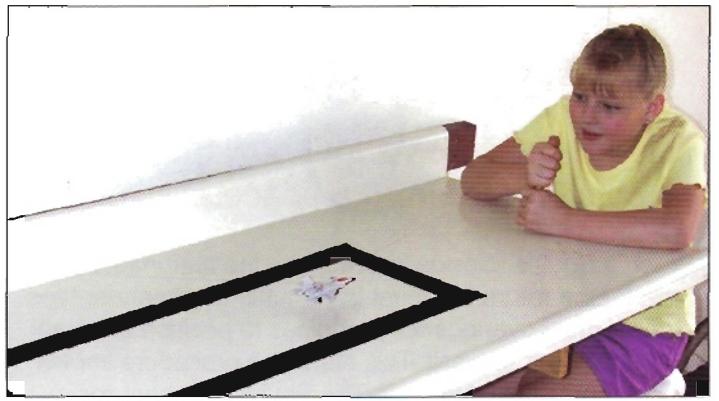
MATERIALS

1. You must find a toy airplane that has a strong set of landing wheels. (Study the lead photo)
2. It is recommended that you consider the “Hot Wings™” die cast model. It is not expensive and you can purchase sponge foam runways. These runways can be used in this activity.
3. You will need two eye screws as shown. [hardware stores]
4. A drill and bit for making two 1/16th inch holes in the top of the fuselage [helps with eye screws]
5. You will also need a small stick; a pencil or ¼ inch dowel rod works fine.
6. A strand of fish line. Strength is not a big problem, however, the larger line is easier to see.

INSTRUCTIONS

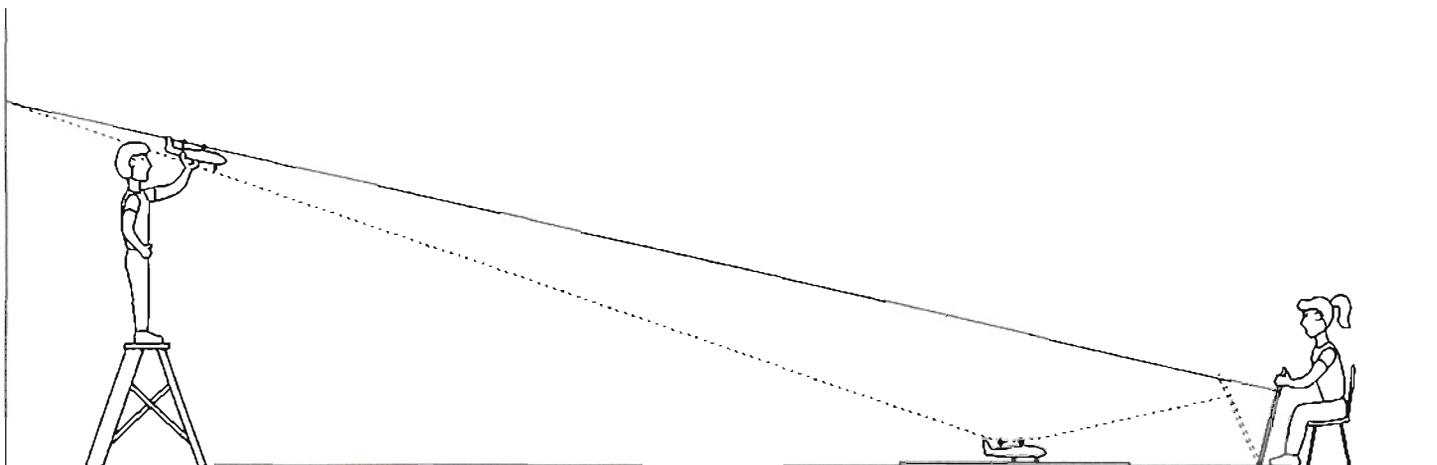
1. Two eye screws are mounted to the top of your model airplane
2. The nylon fishing line is attached to the stick (masking tape works well for this).
3. The other end of the cord is mounted up high some-where in the room.
4. A helper will hook the airplane on the cord at the high end.
5. The pilot sitting in the chair, holding the stick, will call “go” and the little airplane is released.
6. As the airplane “flies” down the cord, the pilot has to land it on the makeshift runway.
7. Have students “land” the Shuttle orbiter on different length runways. Have them record the conditions for landing before the end of the runway. (Do 3 trials per length.)

To do this table top version, either use the Hot Wing™ “runway,” or one made of tape. A small stick, such as 1/4 inch dowel rod or a pencil, about 6 inches long, works quite well for the joystick. The nylon fish line is fastened to the stick and the other end of the line is held by the teacher or helper, 6-10 feet away. When the pilot says, “go,” the little plane is released and begins sliding down the fish line. The pilot must then land it inside the “runway” area.



Name of Shuttle Commander _____

Trial #	5 ft.	10 ft.	15 ft.	Conditions (joystick movement)	Results (hit, miss long, miss short)
1					
2					
3					
4					
5					
6					
7					
8					
9					



If you want to try a larger airplane, it works equally well. All it takes is the installation of two eye screws and more nylon fish line. When the model is released, it slides down the fish line and the pilot has to land it on a “runway.” This runway can be made from masking or duct tape. The object is not to overshoot, or undershoot, the runway. This illustration shows it being used on a large scale.



This is the recommended HotWings™ Space Shuttle and runway package.



You can use the same model on a floor. Notice the fan! This was added for "crosswind at the Cape!" The children can't wait to try their skill at making it land and roll out to a full stop, within the length of a piece of tape.