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It’s that time of year again—welcome to the 5th Annual Sikorsky Helicopter 2050 Challenge! We’re delighted to present the 2015 edition of this innovation-inspiring educational program, developed by BKFK in cooperation with Sikorsky Aircraft and implemented by select museums, schools, school districts, and youth organizations nationwide.

In 2014, this robust STEM (science, technology, engineering, and math) program inspired kids across the country and led to a diverse array of entries. We all cheered when the Skylift Rescue 968—a self-repairing helicopter with a design that mimics the bone structure of birds—was recognized as the top entry. It was submitted by 16-year-old Hana B. of Connecticut; Hana was awarded a $1000 scholarship and a trip to the Sikorsky headquarters in Stratford, CT to meet with engineers and see Black Hawk helicopters being produced.

Girls and young women are generally underrepresented in STEM fields, so we were delighted to have even more excellent entries from girls in 2014 than in years past. Competition was stiff, though, and three of the top entrants were boys—including a 10-year-old who conceptualized the JP-10 Swifter: Helicopter of the People! As of June 1, the competition will be on again. Who will win this year—will it be a boy or a girl?

This year’s program asks kids to come up with a concept for a sustainable, environmentally friendly helicopter of 2050, and we’ll be providing an updated website and new program activities to get kids’ thoughts whirling and soaring.

Our goal is to create the most innovative, relevant, and valuable program possible, in sync with your goals and responsive to the changing needs of the children and families you serve. We’re committed to providing you with motivational, educational material in a way that supports your work, and in order to help you spread the word about your ongoing curricula and initiatives, we have provided a press-release template so you can showcase what’s going on at your museum, school, or youth organization.

This year promises to be a top-flight ride, and we’re looking forward to seeing what all the innovative nine to sixteen-year-olds submit. Could one of the young people you work with be the next Sikorsky Helicopter 2050 Challenge Winner? It’s time to find out! Good luck—and enjoy the ride!

Norman Goldstein
Founder & CEO
By Kids For Kids

Susan Hitchcock
Manager, Community Affairs
Sikorsky Aircraft Corporation
ABOUT SIKORSKY

Sikorsky Aircraft Corporation is a world leader in the design, manufacture and support of military and commercial helicopters and fixed-wing aircraft.


In 1939, Igor Sikorsky piloted the VS-300, considered to be the world’s first successful single main rotor helicopter. Today, Sikorsky Aircraft stays true to the legacy of Igor Sikorsky’s passion for innovation. On May 5, 2011, the National Aeronautic Association awarded Sikorsky the Robert J. Collier Trophy for its next-generation X2 Technology™ demonstrator aircraft, which achieved a speed of 250 knots — twice that of a conventional helicopter — in September 2010.

The NAA specifically cited the X2 Technology team “for demonstrating a revolutionary 250 knot helicopter, which marks a proven departure point for the future development of helicopters by greatly increasing their speed, maneuverability and utility.”

Sikorsky helicopters are used by all five branches of the United States armed forces, and the military services and commercial operators in 40 countries.

The H-60 platform remains the most heavily used U.S. military helicopter: the UH-60M and HH-60M are the most advanced variants of the workhorse BLACK HAWK helicopters for the U.S. Army. The U.S. Navy is standardizing on the MH-60R and MH-60S multi-mission SEAHAWK® helicopters.

Sikorsky is currently developing the CH-53K helicopter to replace Navy and U.S. Marine Corps CH-53E and MH-53E SUPER STALLION™ heavy-lift helicopters. Meanwhile, the venerable SEA KING™ helicopter continues to be flown by government, military and civilian operators worldwide.

Sikorsky’s S-92® medium-lift helicopter is a favorite in the oil and gas industry, for maritime search and rescue, and for carrying heads of state. A military variant, the VH-92 helicopter, is a candidate to become the next ‘Marine One’ to transport the president of the United States. Canada is about to take delivery of the CH148 Cyclone helicopter, a naval variant.

Sikorsky’s venerable S-76® helicopter transports executives, oil and gas operators, and performs search and rescue and EMS missions. The S-76C++™ helicopter variant features a deluxe cabin. In 2012, Sikorsky began deliveries of the S-76D™ helicopters with improved performance, enhanced safety, quieter operation and the ability to fly in forecast icing.

Sikorsky also produces Schweizer 300C™, 333™ and 300CBI™ light helicopters. In Poland, Sikorsky's PZL Mielec affiliate produces the international variant of the BLACK HAWK, the S-70i helicopter, as well as fixed-wing aircraft.

Sikorsky Aircraft Corporation is pleased to bring the 5th Annual Sikorsky Helicopter 2050 Challenge to museums, schools, and science centers across America.

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ABOUT BKFK

CEO Norm Goldstein founded By Kids For Kids (BKFK) on the premise that young people have much to offer the world but rarely get the opportunity to commercialize their innovative ideas.

He saw this firsthand when his daughter Cassidy turned a plastic holder for cut roses into a device to hold broken crayons. This useful and innovative idea resulted not only in a United States patent being issued for her invention (The Crayon Holder) when she was 14, but also in a commercial product that has been sold on store shelves around the nation including those at Walmart.

This experience prompted Norm and Cassidy to research the topic of young inventors. They came up with a large list – people like Philo Farnsworth, the 14-year-old inventor of the television, and Abbey Fleck, who was 8 when she thought up the Makin’ Bacon Holder. The list of inventions by young people goes on and on and includes the helicopter, the sewing machine and Braille, to name a few.

Norm decided to set up a company that could harness the creative ideas of young people, provide young innovators with motivational learning tools, and give the commercial world a unique opportunity to influence kids and communities.

The result was the birth of By Kids For Kids in 2003.

BKFK is a company that empowers kid-driven innovation. We are a trusted intermediary between kids and corporations. Our approach is simple: We use our proprietary kid-driven promotional methodology to channel kid innovation that results in increased brand awareness.

BKFK has earned the trust and respect of America’s largest corporations and foundations, including:

**CORPORATIONS**
- Best Buy
- Staples
- Sports Authority
- Intel
- Xerox
- Build A Bear
- Sears
- Florida Department of Citrus
- Nucor Steel
- Rubbermaid
- Electronic Arts (EA)
- CosmoGirl
- Tommy Hilfiger
- The Weather Channel
- Mattel
- NFL
- NBA
- 20th Century Fox

**FOUNDATIONS**
- The Pearson Education Foundation
- The Kauffman Foundation
- The Intel Foundation
- Best Buy Foundation
- Martinson Foundation
- NYSE Foundation
AWARDS

With teachers and administrators using BKFK programs in 30 countries, our work has been recognized by global organizations, Fortune 100 companies, and the United States Government.

- BKFK.com was voted as one of the Top 100 Educational Websites of 2007 at Homeschool.com.
- BKFK’s Norm Goldstein received the 2006 (ET3) Education Technology Think Tank TEC Champion Leadership Award during the Congressional Black Caucus.
- BKFK was honored with the Congressional Award For Empowering Youth through Exemplary Public-Private Partnership.
- BKFK received Congressional Recognition via the 2005 ET3 TEC Championship Award.
- CEO Norm Goldstein has been named a Purpose Prize fellow. The Purpose Prize is an award for exceptional individuals who are defying expectations by channeling their creativity and talent to address critical social problems at the local, regional, or national level.
- Cassidy Goldstein, Norm’s daughter and a co-founder of the company, was named Youth Inventor of the Year by the Intellectual Property Owners Education Foundation in 2006.
- BKFK and Xerox have been awarded The Connecticut Economic Development Association and the Connecticut Economic Resource Center's "Eddy" Award for developing "Inventive Thinking" programs for Connecticut children. Each year, the "Eddy" goes to outstanding economic development professionals, companies, projects and programs that exemplify the Team Connecticut spirit and positively impact the Connecticut economy.
- The World Intellectual Property Organization (WIPO), a United Nations agency dedicated to ensuring the recognition and protection of the rights of inventors and authors worldwide, lists only 6 websites, including M.I.T.’s, as online sources for information on inventive thinking. BKFK’s is one of those sites.
Welcome to the 5th Annual Sikorsky Helicopter 2050 Challenge and Program Guide. All kids are welcome to participate in the activities and experience the wonder of flight! The Sikorsky Helicopter 2050 Challenge lets kids flex their creative muscles through the process of conceptualizing and creating THEIR OWN vision of a helicopter of the future.

The activities included in the BKFK 5th Annual Sikorsky Helicopter 2050 Challenge give kids the opportunity to create, invent and design innovative future helicopters. Activities focus on the skills of problem-solving, building/production, trouble-shooting, art/drawing, written & verbal expression, or even play-acting.

Experience tells us that kids will read, write about, and become actively engaged in the things that they find interesting. This program harnesses the motivation behind creating in order to engage kids in deep reflective activities.

**ACTIVITIES**

Use the activities here to begin engaging kids in the helicopter flight experience. These activities will help kids envision the helicopters of the future while learning about the basics of flight and the invention process.

**Warm-Up Activities**
- Being Machines
- Doodle Dids
- Make Simple Better

**Take-Flight Activities**
- It’s a Real Drag
- We Have Lift Off
- Get The Ball Flying
- Follow the Bouncing Ball
- From Paper to Helicopter
- StyroCopters in Flight
- Sikorsky Take It For A Spin
- May The Forces Be With You
- Rubber Band Helicopter
- Calling Chopper Control
- Higher/Faster/Farther
- Choppers to the Rescue
- Igor’s Dream
- Building a Better Chopper

**New! Sustainability Activities**
- Turn Down the Volume
- Help Engines to Stop Smoking
- Electricity’s Shocking Challenges
- Lose Weight to Save Gas

**Leaner & Greener ’Copters Activities**
- It’s All About Energy
- Cool ’Copters for a Better World
- A Tunnel of Fun
- Building a Leaner, Greener ’Copter
- Turn Old into New Again

**Goin’ Global! Activities**
- What Are Global Challenges?
- Rising to the Challenge
- Education, Helicopters, and the Future
- The Right ’Copter for the Job

**Up, Up And Away Activities**
- Problem Identifier
- Draw It Out
- Refining Ideas
- SCAMMPERR
- Name It

**COMPETITION**

Once your kids have developed inventive thinking skills, it’s time to put those skills to the test by entering the 5th Annual Sikorsky Helicopter 2050 Challenge. You will find all the forms you need in this binder.
When kids are ready to submit their idea(s) into the 5th Annual Sikorsky Helicopter 2050 Challenge, they may easily enter online at www.Helicopter2050.com. Review the official rules on the program website. Alternately, kids may use the official entry form found at the back of this binder. They will need their parent’s permission (whether entering online or by mail). For mailed entries, kids should fill out the official entry form and mail their submissions to:

Sikorsky Helicopter 2050 Challenge
c/o By Kids For Kids Co.
1177 High Ridge Rd.
Stamford, CT 06905

Good luck and happy innovating!
WIN A $1,000 SCHOLARSHIP

CREATE THE ECO-FRIENDLY HELICOPTER OF THE FUTURE

Entry dates: June 1, 2015 – October 15, 2015

Enter the Helicopter 2050 Challenge!
One grand prize winner will win a $1,000 scholarship and get to visit Sikorsky headquarters to see how helicopters are made!

Visit www.helicopter2050.com to read the official rules and enter!

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Kids 9–16 can enter the 5th Annual Helicopter 2050 Challenge without completing any of the supplemental activities—it all depends upon how much time is available! If time is limited, focus on helping kids complete and submit their challenge entry at www.helicopter2050.com. If you have a bit more time and/or are working with a wider age-range, consider the guide below—and feel free to customize it to meet your own needs. You may find that you wind up with more or less time available than planned. If so, omit activities from the bottom up, or add activities from the top down. Have fun—the sky’s the limit!

### Suggested Activities Based on Schedule and Audience

(within each cell, activities are placed in order of priority)

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Sikorsky Helicopter 2050 Challenge Activity Pacing Guide

5th ANNUAL
HELCHECOTER 2050
CHALLENGE
Though you determine which presentation style/format best meets the needs of your site, visitors, and/or students in presenting the Sikorsky Helicopter 2050 Challenge, several basic parameters should be followed, and resources be readily available. Your choice of activity and number of participants will determine specific daily needs.

**LOCATION**
Set up a Sikorsky Helicopter 2050 Challenge central area:
- Set up registration table
- Blackboard/Whiteboard
- Space and tables for a minimum of 6 “Launch Pads”
- Access to electricity
- Access to space outdoors (for testing and launching)
- Tool table
- Materials table
- Proximity to telephone and restroom facilities

**STAFFING**
Introduce team of “Flight Instructors”:
- Lead instructor (1) for up to 25 students, 2 for over 25
- Assistants (1 to 5 ratio), 1 assistant per 5 students
- Assistants can be staff, volunteers, college interns
- Assistants should be identified by the 5th Annual Sikorsky Helicopter 2050 Challenge name tags
- All staff/volunteers should wear name tags.

**TOOLS/MATERIALS**
Gather basic materials and tools to help Flight Instructors. See individual module for activity-specific tool/material needs.

**TOOLS**
Set up on table; assigned/monitored by assistants:
- Butter knife
- Duct Tape
- Electrical wire
- Glue
- Hair Dryer/Small Shop Vacuum with “Blow”
- Hand Saw
- Masking tape
- Matches
- Measuring tape
- Meter/Yard Stick
- Paper Clips
- Protractor
- Rulers
- Scissors
- Sheet Metal Sheers (Snips)
- Spring scale (if available, 10 kg)
- Stopwatch
- Strong Papercutter
- Utility Knife
- Wire Cutters (Snips)
- 4-ft. (48”) length of Sonotube® or similar cardboard or fiber concrete-forming tube, 8”–10” in diameter (available at home-improvement stores)
SUGGESTED MATERIALS
Sorted in tubs and distributed/monitored by volunteer/assistant. Museums provide materials.

- 2-Liter Soda Bottles
- 2 notebook paper reinforcement rings
- 2 small hooks (cup hanger hooks)
- A bucket or similar container of sand/fine gravel
- A piece of transparency film, acetate or other transparent material
- A sturdy cardboard box the same size as the “honeycomb” egg carton separators (or pieces of heavy cardboard)
- Aluminum Foil
- Balloons
- Bamboo or Balsa Strips of Wood (2 inch wide)
- Basketball
- Broomstick or other strong piece of wood
- Candle
- Cardboard
- Chopsticks (round and square)
- Clothesline
- Cotton thread or string
- Corrugated Cardboard
- Crayons
- Drawing Paper
- Electrical Conduit, EMT
- Examples of items made from the following materials
  - Kevlar (non-stick cookware, tennis racket)
  - Titanium (jewelry – possibly a ring, golf club, other sporting goods)
  - Aluminum (cooking utensils, cookware, tools)
  - Carbon-fiber-reinforced polymer (CFRP) or carbon-fiber graphite composites (fishing rod, tent pole, hockey stick, pool cue)
- Floating Tub Toys
- Flying Disk (Frisbee™)
- Food coloring
- Football
- Hand/Bath Towel
- “Honeycomb” light cardboard separators from an egg carton (these are often available from a grocery store, bakery, or restaurant; you can also build your own from strips of light cardboard)
- Hula Hoops
- Index Cards
- Light emitting diode (LED): (may be scrounged from a toy, flashlight, or ordered online)
- Markers
- Nickles (5+) and Pennies (5+)
- Nylon fishing line
- Paper
- Pencils
- Pens
- Plastic Beads
- Plastic Bucket or Small Wading Pool
• Portable Fan/Small Blower
• Potatoes
• Quarters ($) or Metal Washers
• Rope
• Rubber Bands
• Screwdriver
• Several model helicopters (either plastic scale models or the paper models made in activities of this program)
• Small bowl
• Spoons
• Spray Bottle
• Stiff Wire (Floral Wire)
• Straight Pins
• Straws
• String/Twine
• Styrene Meat Trays
• Table Salt
• Tennis Balls
• Tent Pegs
• Thin Copper Wire
• Thin Sheet Aluminum
• Tin Cans
• Water
• White Vinegar
• Wide bowl or Baking Dish
• Wood Dowel
BEFORE EACH HELICOPTER 2050 CHALLENGE ACTIVITY:
(for pre-registered or camp settings)
• Secure registration list
• Verify head count
• Gather materials/tools
• Meet your volunteers
• Distribute activity sheets
• Go over activity/agenda
• Prepare room/location
• Put on name badges

UPON ARRIVAL OF PARTICIPANTS:
• Greet participants
• Identify any special-needs children
• Assign participants to stations
• Introduce yourself, assistants, and volunteers
• Identify nearest restroom/locker/help desk
• Distribute materials
* Start BRAINSTORMING!

THROUGHOUT EACH ACTIVITY:
• Routinely take a head count
• Keep control of tools/scissors/sharp objects
• Float from table to table – ensuring equal attention to all participants
• Watch for discouraged or stuck participants and help them get a jump start
• Be positive in your suggestions
• Celebrate the trials as well as the successes
• Have participants think up cool names for their inventions/for themselves
• Let each participant tell you their story – what they've done and why it's cool
• Encourage them to make improvements, not stop with their first idea
• Get creative yourself
• Watch your time
• Make sure everyone leaves knowing they’ve accomplished something
• Be inspired
• Be inspiring!

AT THE CLOSE OF EACH ACTIVITY/CAMP:
• Encourage participants to begin making final adjustments (5-7 minutes to go)
• Have each participant give you one word about their experience
• Record feedback on notes page
• Return tools to tool table
• Tidy up work stations
• Make sure kids have their personal belongings they brought to the activity
• Make sure kids have their competition entry
• Give each participant their Certificate of Achievement
• Applaud all the participants of the day
• Return space to original condition
• Return tools/materials to designated storage location
• Record participant numbers
• Relay any participant feedback (positive and negative) to BKFK
FREQUENTLY ASKED QUESTIONS

You can use these for your participants or to answer questions on your website.

Q: WHAT IS THE SIKORSKY 2050 CHALLENGE?
A: The 5th Annual Sikorsky Helicopter 2050 Challenge is an inventive thinking/creativity program developed by By Kids For Kids and Sikorsky in partnership with the nation’s top Children’s and Science Museums and Learning Centers.

Q: WHO IS IT FOR?
A: The Museum program for the 5th Annual Sikorsky Helicopter 2050 Challenge is for kids in grades K–8. The competition portion of the program is open to kids 9–16.

Q: WHAT SPECIFICALLY WILL PARTICIPANTS GET TO DO?
A: The Helicopter 2050 Challenge lets kids be as creative as they want to be through brainstorming, hands-on learning, and invention activities. Activities are flexible and designed to be fast paced, with hands-on building…messes optional…fun required!

Q: WHERE CAN I SIGN UP MY CHILD FOR THE CHALLENGE?
A: The Helicopter 2050 Challenge is offered through select top Children's Museums, Learning Centers, Schools and School Districts across the nation.

Q: WHEN DOES IT START?
A: The official Helicopter 2050 Challenge will begin June 1. Each participating organization will follow its own individual programming calendar.

Q: IS THIS A CAMP?
A: Each Official Helicopter 2050 Challenge Museum site has been given the materials and latitude to offer the program in several formats:
   a) As individual classes;
   b) As part of a summer series;
   c) As part of a week-long camp.
   Additionally, schools and school districts may offer the program in the format that best suits their needs.

Q: HOW MUCH DOES IT COST?
A: Each Official Helicopter 2050 Challenge Museum site is responsible for setting their own summer programming schedule, as well as determining visitor/member cost. Check with the site near you for details.
ACTIVITIES TO WARM UP!

To help your visitors get their head in the creativity game and get their brain waves flowing, start out activity sessions with these Warm-Up Activities – then stand back and let the brainwaves sizzle!

1. **Being Machines:** This activity promotes imaginative thinking and creating a unique simulation of imaginary machines.
2. **Doodle Dids:** This activity is an exercise in free association and helps children see something real in something abstract.
3. **Make Simple Better:** Participants will invent something new by putting 2 simple things together.

When kids are ready to submit their idea(s) into the 5th Annual Sikorsky Helicopter 2050 Challenge, they may easily enter online at [www.Helicopter2050.com](http://www.Helicopter2050.com). Review the official rules on the program website. Alternately, kids may use the official entry form found at the back of this binder. They will need their parent’s permission (whether entering online or by mail). For mailed entries, kids should fill out the official entry form and mail their submissions to:

Sikorsky Helicopter 2050 Challenge  
c/o By Kids For Kids Co.  
1177 High Ridge Rd.  
Stamford, CT 06905

Good luck and happy innovating!
**ACTIVITY OBJECTIVE:** This activity promotes imaginative thinking and creating a unique simulation of imaginary machines. Participants experience inventing the moving parts of a machine through simulation and play-acting, and invent using their body kinesthetic senses.

**TIME REQUIRED:** 45 minutes

**MATERIALS NEEDED:**
- Open space indoor or outside
- Print and cut out the separate machines to pantomime. Fold into small pieces of paper and place into bowl or bag so each team can pick out their machine.

**WHAT TO DO:**
Model the sounds and motions of a machine. Ask the kids to guess what you are doing. For example, you can turn around back and forth while saying “swoosh- swoosh” and be a washing machine.

If you want the kids to feel comfortable doing something silly, you have to model a little!

Once the kids understand the concept, pair them into groups and have them play a charades-like version of making machines. Have each group pick a machine and quietly work together to make a machine. Other teams watch each pantomime and guess. When the children have finished this activity, ask them to invent their own machines.

Finally, have each child begin to make a big make-believe machine by standing in the middle of an open area and making machine sounds and/or movements. The next child comes and joins, making complementary sounds. The kids must be touching somewhere for part of the time. The next child comes up and adds to the “big” machine until everyone is attached to the machine.

**EXTENSION:**
Video tape this experience and play back so the kids can see themselves.

Have the class research machines on the internet and print pictures. Have them act out the machines they find.

**Some Machines:**

- Washing machine
- Lawn mower
- Vacuum cleaner
- Car
- Garbage disposal
- Airplane
- Tractor trailer
**ACTIVITY OBJECTIVE:** This activity is an exercise in free association and helps children see something real in something abstract. It is a good preparatory experience for creating a logo for a real product. Graphics are an increasingly important means of communication in the digital world and playing with shapes and forms precedes creating an abstract representation for a concept or product.

**TIME REQUIRED:** 30 minutes

**MATERIALS NEEDED:**
- Markers
- Crayons
- Drawing Paper

**WHAT TO DO:**
Have all the participants sit comfortably at desks or tables. Have magic markers and paper available in front of each person. Ask the participants to watch you as you make some shapes with your hand in the air, drawing small swirls and circles with an imaginary marker.

Now ask them to do the same thing. Have them use an imaginary marker in the air and draw “doodles” (curvy lines and circles).

Now have them draw a “doodle” on their paper very quickly. It should be similar to the doodle they did in the air. Allow them about 45 seconds for it. When the time is up, have them put their marker down and ask them to look at their “doodle” and see if they can find a picture of an object, person, or landscape in their doodle. They can turn the paper around to find their picture.

Using crayons, they can expand the original doodle into a full picture.

**EXTENSION:**
A variation is to hand one child’s doodle to another to make it into something new.

Another idea is to give less time for the doodle and actually have them create a logo for a chosen product from the doodle.
ACTIVITY OBJECTIVE: Participants will invent something new by putting 2 simple things together.

TIME REQUIRED: 45 minutes

MATERIALS NEEDED:
- Sample List
- Paper
- Pens

WHAT TO DO:
The facilitator should have each participant team up with a partner and give each group a list of things – you can find a sample list below. The facilitator will instruct them that some wonderful inventions were made by putting 2 simple things together, such as:
1. Windsurfer = Surfboard + Sail
2. In-flight movies = TV + Airplane
3. Rollerblades = Wheels + Skates

The teams will combine 2 things to make something better. They can then present their new inventions to the group.

Sample Objects

<table>
<thead>
<tr>
<th>Pen</th>
<th>Candy</th>
<th>Comb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scissors</td>
<td>Telephone</td>
<td>Paper</td>
</tr>
<tr>
<td>Watch</td>
<td>Radio</td>
<td>Glove</td>
</tr>
<tr>
<td>TV</td>
<td>Shovel</td>
<td>Car</td>
</tr>
<tr>
<td>Chair</td>
<td>Cup</td>
<td>Paint</td>
</tr>
<tr>
<td>Ball</td>
<td>Desk</td>
<td>Telescope</td>
</tr>
<tr>
<td>Balloon</td>
<td>Camera</td>
<td>Plate</td>
</tr>
<tr>
<td>Parachute</td>
<td>Piano</td>
<td>Wheel</td>
</tr>
<tr>
<td>Needle</td>
<td>Lock</td>
<td>Book</td>
</tr>
<tr>
<td>Fork</td>
<td>Ruler</td>
<td>Sneaker</td>
</tr>
<tr>
<td>Bell</td>
<td>Bed</td>
<td>Pants</td>
</tr>
<tr>
<td>Diamond</td>
<td>Soap</td>
<td>Shirt</td>
</tr>
<tr>
<td>Blanket</td>
<td>Hammer</td>
<td>Pillow</td>
</tr>
<tr>
<td>Bicycle</td>
<td>Suitcase</td>
<td>Key</td>
</tr>
<tr>
<td>Bag</td>
<td>Boat</td>
<td>Bottle</td>
</tr>
<tr>
<td>Trash can</td>
<td>Train</td>
<td>Bottle</td>
</tr>
<tr>
<td>Window</td>
<td>Doghouse</td>
<td>Plate</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>Treadmill</td>
<td>Computer</td>
</tr>
</tbody>
</table>

EXTENSION:
You could use a list of foods or animals.
TAKE-FLIGHT ACTIVITIES
Welcome to the guide to the Take-Flight portion of the 5th Annual Sikorsky Helicopter 2050 Challenge. These activities will help participants learn the basics of helicopter flight so they can dream of the future of helicopters.

- It’s a Real Drag!
  Kids will learn about the effects of drag, the force of resistance by the air to the passage of an aircraft through it.
- We Have Lift-Off!
  Kids will demonstrate and observe the key aerodynamic principles of thrust and lift by creating and operating a simple and safe “potato rocket launcher” that uses the power of compressed air to propel small pieces of potato into “space”.
- Get the Ball Flying!
  The key aerodynamic principles of thrust and lift are demonstrated with a simple motor-driven rocket launcher.
- Follow the Bouncing Ball
  Another launcher activity that involves not only lift and thrust but also the concept of momentum.
- From Paper to Helicopter
  Kids learn the fundamentals of helicopter design with a practical demonstration of spin and other principles involved in helicopter (rotary) flight.
- Styro-Copters in Flight!
  Kids construct and “fly” a very easy-to-make “helicopter” design using a styrene meat tray or similar flat piece of styrene or styrofoam.
- Take It for a Spin!
  Everyday objects demonstrate the principle of spin.
- May the Forces Be with You!
  Kids will employ simple, everyday items to demonstrate torque, an important force that must be overcome or counteracted in order for a helicopter to fly.
- Take Off... With a Rubber-Band Helicopter!
  This activity steps up the helicopter-design ladder to simulated “powered flight”, with kids constructing and flying a simple rubber-band-powered helicopter.
- Calling Chopper Control!
  In this activity, kids will attempt to fly the rubber-band helicopter they constructed and control it in various ways in a series of fun “field trials” they will set up and conduct to demonstrate firsthand some of the unique challenges of helicopter (rotary) flight.
- Higher, Faster, Farther
  Kids can have fun becoming “aircraft designers” by building and testing flying discs and rings to see which designs fly highest, fastest and farthest, just as aircraft designers do in real life.
- Choppers to the Rescue! (Water Rescue Challenge)
  In a fun way, this activity challenges participants to demonstrate how helicopters have been used to rescue countless people from emergency situations and have recovered American astronauts and spacecraft from the ocean after manned space missions. Kids can also explore future emergency uses for helicopters.
- Igor’s Dream
  This activity focuses on how Igor Sikorsky’s legacy lives on through the many and varied uses of helicopters today, challenging kids to illustrate as many current and possible uses as they can think of by creating scenarios based on silhouettes of several types of Sikorsky helicopters.
- Building a Better Chopper
  Following earlier themes of helicopter development and design, this activity challenges kids to learn how designers of helicopters and other aircraft strive to protect their craft from corrosive and harmful elements.
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Good luck and happy innovating!
**ACTIVITY OBJECTIVE:** This activity enables participants to demonstrate and observe the effects of drag, the force of resistance by the air to the passage of an aircraft (or any object in flight) through it. In a simple experiment using everyday objects, kids will drop and observe two identical cards with pennies attached to different locations on the cards, which will fall at different rates because one encounters more drag (or resistance) than the other.

**TIME REQUIRED:** 10 minutes

**MATERIALS NEEDED:**
- 2 index cards or same-size rectangular pieces of stiff cardboard per team
- 2 pennies per team
- glue
- meterstick or yardstick

**WHAT TO DO:**

Divide the group into teams of two and distribute 2 cards and 2 pennies to each team. Have each team glue a penny to each card – in the center on one card, and along the short edge on the other card; let the glue dry.

With one team member using the meterstick (or yardstick) to determine a point about one meter (or yard) above the floor, have the other member hold both cards parallel to the ground at that height, then drop them simultaneously.

Kids will observe that the card with the penny glued along the short edge will fall vertically and much faster than the other. Why? Although both cards have the same weight, the one with the penny glued in the middle presents a much larger surface area to the air, so encounters more resistance (drag) and will therefore fall more slowly. The smaller the area exposed, the less resistance encountered; lower resistance (or drag) allows higher speed.

**EXTENSION:**

You might extend this activity by having kids try a similar experiment using two identical flying disks. Have them drop one disk that’s oriented vertically, and the other oriented horizontally, and watch what happens. Then talk about how finding ways to reduce drag would be important in designing aircraft – including helicopters – or anything that moves fast through air or water.
ACTIVITY OBJECTIVE: In this activity, kids demonstrate and observe the key aerodynamic principles of thrust (the force that moves an aircraft or other object through the air) and lift (the force that overcomes the weight of an aircraft so it can rise in the air) by creating and operating a simple and safe “potato rocket launcher” that uses the power of compressed air to propel small pieces of potato into “space” (actually a short distance into the air). We like to call these potato projectiles “spud-niks” in honor of both the potato’s nickname (spud) and the first space satellite, Sputnik.

TIME REQUIRED: 15 minutes

MATERIALS NEEDED:
• 4-foot length of ¾”-diameter electrical conduit (Electrical Metal Tubing, or EMT) for each launcher
• 4-foot length of wooden dowel (just under ¾” in diameter, so that it barely slides inside the tubing) for each launcher
• bag of potatoes

WHAT TO DO:
You can choose to conduct this outdoor activity using just one launcher, with participants taking turns “launching” their spud-niks into the air; or you can divide the group into teams of two and distribute enough lengths of tubing (conduit) and dowels for each team to operate its own launcher.

Either way, have kids load their launchers by holding a potato against one end of the length of tubing and whacking it a few times with the palm of the hand, jamming a cylinder of spud into the opening. After the tubing has cut clear through the spud, they can pull the potato up and off the tube, leaving a nice plug of spud in the “launcher”. Repeating this procedure on the other end will leave the launcher fully loaded.

For each launch, have a kid force a dowel a few inches into one end of the tube, placing the other end of the dowel against the ground. Making sure that they keep their feet clear of the dowel, have each “launch captain” pull the tube down toward the ground quickly; the upward action of the dowel forces compressed air against the plug of spud, producing thrust that pushes it out of the tube and launching the spud-nik into the sky.

EXTENSION:
If you have the time and outdoor space required (as well as the resources to provide each team with a launcher of their own), you might use the potato rocket launcher as the basis of a “Spud-nik Derby” competition in which two-person teams of kids compete to see whose spud-niks can fly the highest and the farthest. Teams can even personalize and decorate their launchers if they wish.
ACTIVITY OBJECTIVE: Here is another activity in which kids demonstrate the key aerodynamic principles of thrust and lift with a simple motor-driven “rocket launcher”. Constructed under supervision using PVC pipe and an electric hairdryer, small shop vacuum or leaf-blower, this safe, easy-to-build launcher employs a fast-moving stream of air to propel ping-pong balls into flight.

TIME REQUIRED: 30 minutes

MATERIALS NEEDED:
- Electric hair dryer, small shop vacuum or small electric leaf-blower
- 1-foot length of 1 ½” diameter PVC pipe
- 4-foot length of 1 ½” diameter PVC pipe
- PVC “T” fitting for 1 ½” diameter pipe
- Box of plastic ping-pong balls
- Piece of sandpaper
- Electrical extension cord

WHAT TO DO:
You may choose to conduct this activity using just one launcher, with two-person teams taking turns operating a launcher that the entire group works together to construct. Or, you can have the group build and operate as many launchers as available materials allow. Whichever approach you choose, each launcher should be constructed under supervision and operated only in a safe area, preferably outdoors with electrical power supplied from indoors via a properly grounded and safely installed extension cord, or in a large indoor area with safe access to electric power.

Construction for each launcher:
1. Smooth the ends of each piece of PVC pipe with sandpaper to remove sharp surfaces.
2. Fit the 1-foot length of PVC pipe into the middle leg of the “T” fitting.
3. Insert the tip of the “power plant” (hairdryer, leaf-blower or shop-vacuum hose) into one of the other two ends of the “T”. Position it so that the stream of air leaves the device at the center of the “T” without blocking the path coming from the middle leg, adjusting the placement until you can feel suction on the end of the PVC pipe in the middle leg when the device is turned on. (NOTE: If a shop vacuum is used as the power plant, make sure that the vacuum is set in reverse or blowing position before being turned on.)
4. Complete the launch tube by inserting the 4-foot length of PVC pipe into the remaining end of the “T” fitting.

Operation: In a safe area, have two-person teams operate each launcher. Have one team member hold the launcher steady, pointing out at about a 45-degree angle, with the middle leg of the “T” (the load tube) pointing upward. Turn on the blower and have the second team member load a ping-pong ball into the load tube. The suction created by the load tube will draw the ball into the launcher, then the stream of air will propel it out through the launch tube and into the sky!

EXTENSION:
Have kids investigate how the length and the angle of the launch tube might affect the distance the launched ping-pong ball travels, or what happens when heavier and denser balls (such as a golf ball) are launched (taking great care not to hit anything or anyone) – do they travel farther?
ACTIVITY OBJECTIVE: In this final, fun “launcher” activity that involves not only lift and thrust but also the concept of momentum (mass multiplied by velocity), kids will make and demonstrate a simple launcher – created from a basketball and a tin can – that uses momentum-transfer to launch a tennis ball some 30 feet into the air. This activity is best performed outdoors on a hard paved surface, or in a high-ceilinged indoor space such as a gymnasium.

TIME REQUIRED: 15 minutes

MATERIALS NEEDED:
- basketball
- 2 tennis balls
- tin can
- duct tape
- a variety of lighter balls
- can opener

WHAT TO DO:
You may choose to conduct this activity using just one launcher, with kids taking turns to operate the launcher. Or you can procure and distribute enough basketballs, tennis balls, tin cans and duct tape to allow each kid to make and demonstrate his or her own launcher, or as many launchers as available materials allow. In either case, conduct the activity outdoors or in a high-ceilinged, gym-like indoor space.

Construction for each launcher:
1. Carefully remove both ends of the tin can with the can opener.
2. Using the duct tape, securely tape the can to the basketball so that one of the open ends of the can is resting on the ball.

Operation:
1. Holding the basketball at eye level with the can facing up, drop the ball and observe how high it bounces.
2. Load one tennis ball into the can (pointing up), return the basketball to eye level, and drop it again, observing how high the tennis ball flies.
3. Repeat step 2, but this time watch how high the basketball rebounds – did it bounce as high as it did without the tennis ball in the launcher?
4. Now try repeating the process, loading and launching two tennis balls at once, then try other lighter balls and see what combination results in the highest launch; be sure to observe how high the basketball bounces as more balls are added to the launcher.

EXPLANATION:
You should be able to launch the tennis ball between 20 and 30 feet in the air by dropping the launcher (the basketball) from a height of only five feet or so! Here’s what happens: Because the basketball is heavier than the tennis ball, its momentum \((\text{mass} \times \text{velocity} = \text{momentum})\) is much greater than that of the tennis ball. As the basketball hits the ground or pavement, then collides with the tennis ball held inside the can, some of the basketball’s momentum is transferred to the much lighter tennis ball, sending it flying high into the air.

EXTENSION:
Have kids “fire” their launchers from various heights, measuring how high the basketballs rebound with and without a tennis ball in the launcher, as well as how high the tennis ball flies.
ACTIVITY OBJECTIVE: In this activity, kids get their first taste of “helicopter design” – and a practical demonstration of spin and other principles involved in helicopter (rotary) flight – by making two different types of paper helicopters (sometimes called “flutter mobiles”) that spin as they “fly” to the ground after being dropped from a height.

TIME REQUIRED: 30 minutes

MATERIALS NEEDED:
- 8 ½” x 11” sheets of paper (two per participant)
- paper helicopter (flutter mobile) patterns (#1 is self-explanatory; #2 is pictured here)
- scissors
- tape
- paper clips
- pencil
- ruler

WHAT TO DO:

Paper Helicopter (Flutter Mobile) #1:
1. Measure out and cut a strip 1” wide and 8 ½” long from one sheet of paper.
2. Measure 1” from each end of the strip, then cut a ½” notch on opposite sides of the strip.
3. Bending the strip over on itself, connect the two ends together by matching up the two notches and sliding them together…and your first paper chopper is complete!
4. Holding the helicopter by one of its sides, drop it from the top of a set of stairs; it should flutter gently and spin as it slowly falls to the ground.

Paper Helicopter (Flutter Mobile) #2:
1. Using a pencil and a ruler as a straightedge, trace or copy the pattern provided here onto a clean sheet of paper, making sure to copy the dashed lines as they are pictured.
2. Using a pair of scissors, cut out the shape; be sure to cut only on the lines that appear solid, and fold on the dashed lines.
3. Bend the “wings” at the top of the pattern back in opposite directions, so that they are perpendicular to the rest of the helicopter.
4. Finally, fold up the bottom flap and tape it in place… and your second paper chopper is complete!
5. Holding the helicopter gently, drop it from a high, safe location when the air is calm; it will auto-rotate to the ground.
EXPLANATION:
Although neither of these two types of paper helicopters is actually “flying” (rising through the air) on its own, each illustrates different aspects of lift and spin, both of which play a role in the action of the “helicopter” as it slowly flutters to the ground. In #1, enough lift is produced by the air passing through the paper strips as they spin to slow the helicopter’s descent. In #2 – whose “rotor” design more resembles that of a real helicopter – the auto-rotation or spin caused by the air passing above the rotors produces the lift needed to slow the helicopter’s fall.

EXTENSION:
Have kids try these variations and observe the effects: attach paper clips to add weight; make larger and smaller versions of each design; construct a heavier version from construction paper.
ACTIVITY OBJECTIVE: This activity has kids construct and “fly” a very easy-to-make “helicopter” design – made from a styrene meat tray or similar flat piece of styrene or styrofoam – that spins to slow its fall in much the same way that a maple-seed pod does when it flutters to the ground.

TIME REQUIRED: 15 minutes

MATERIALS NEEDED (FOR EACH LAUNCHER):

- Styrene meat tray or other flat piece of styrene or Styrofoam for each participant
- scissors
- jumbo paper clips
- pencil
- ruler

WHAT TO DO:

1. Have kids trace or copy the pattern provided here onto the styrene meat tray or Styrofoam piece, and cut it out with the scissors.

2. Attach a large paper clip to the straight edge of the cut-out spinner shape.

3. Standing on stairs or another high but safe spot, have kids toss their styro-copters into the air; they should spin in a spiral fashion as they fall to the ground.

4. If you choose, you might challenge kids to make and fly more styro-spinners in a variety of sizes and shapes.

EXPLANATION:

As the styro-spinner falls, with its leading edge weighted by the paper clip, air rushing past it causes it to rotate (spin). This rotation gives stability to the spinner’s fall, while air hitting the lower side produces drag, which slows the descent. In much the same way, air passing the rotors of real-life helicopters that lose engine power can sometimes slow their descent enough to reach the ground safely.

EXTENSION:

After kids have launched their spinners, ask them what natural object the spinner reminds them of as it makes its way to the ground; some will reply that the spinner’s motion resembles that of a maple-seed pod as it flutters to earth. You might want to obtain a maple-seed pod, have kids drop it alongside their spinner, and compare their speeds and flight patterns.
ACTIVITY OBJECTIVE: In this activity, kids use everyday objects to demonstrate the principle of spin (or rotation), an important element in the ability of many things to fly, from flying discs to boomerangs to – of course – helicopters. Spinning contributes to lift, a key component of flight, as well as to the stability of an object as it flies.

TIME REQUIRED: 10 minutes

MATERIALS NEEDED (FOR EACH LAUNCHER):
- A quarter
- Flying disc (Frisbee™)
- A football
- A flat tabletop

WHAT TO DO:
1. Have each kid place the edge of a quarter against the tabletop and try to balance it on one edge; can they do it? Then suggest that they try spinning it; with a good flick of the wrist, they should be able to spin the quarter fast enough so that it stays upright for a few seconds.
2. Have kids attempt to do the same thing with the flying disk as they did with the quarter, then observe the results; does it work?
3. Then have them repeat the procedure once more, this time attempting to get the football to remain upright. Again, if it doesn’t work, have them spin the football and see what happens.
4. Here’s one more experiment kids can try. Have them spin the quarter on the table, watching it to see which way it’s spinning – is it spinning clockwise or counterclockwise? Then, have them spin it again, then attempt to blow the quarter across the table, and watch what happens next.

EXPLANATION:
As the kids attempt to get the objects to stay upright, and then add spin to the equation, they’ll see for themselves that spinning provides stability to the object and prevents it from falling over – whether it’s the quarter, the flying disk or the football. In the case of the quarter, gravity pulls it down and it begins to fall, but because the force on a spinning object acts 90 degrees away, the spinning quarter will pull itself back up!

When the kids attempt to blow the spinning quarter across the table – i.e., apply a force to a spinning object – it moves in a direction 90 degrees from where the force is applied. So instead of moving across the table, the quarter turns 90 degrees away from where they thought it would go. This is the same effect that enables boomerangs to return after they are thrown, and makes flying disks veer to one side.

EXTENSION:
Turn the spinning actions used in this activity into a “spin-a-thon” competition by challenging kids to take turns trying to keep the quarters, footballs and/or flying disks spinning as long as possible within a small square space marked out on the table or floor with masking tape, and timing their efforts with a stopwatch. In each case, the kid whose object remains spinning the longest wins.
ACTIVITY OBJECTIVE: In this activity, kids employ simple, everyday items to demonstrate torque – the tendency of a spinning object to create spin in the opposite direction – an important force that must be overcome or counteracted in order for a helicopter to fly. They will also become acquainted with and perform simple demonstrations of stress forces that come into play in helicopter flight, including torsion, tension and compression.

TIME REQUIRED: 15 minutes

MATERIALS NEEDED (FOR EACH LAUNCHER):

- Pencil
- Plastic ruler (the type with a hole in the center and equidistant slots in each side)
- 10-foot length of rope (clothesline or sash cord will do nicely)
- Quantity of rubber bands of various sizes
- String or twine
- Scissors
- Tape
- Screwdriver (with a shaft at least 3" long)
- Hand or bath towel

WHAT TO DO:

The following demonstrations of torque can be performed by as many members of the group as you have materials for, or you can have kids take turns doing them for the entire group.

1. Have kids take a pencil and push it into the hole in the center of a plastic ruler until it fits snugly about halfway down the pencil, creating a rotor. Then place the pencil point against a table and give it a few spins, so that the ruler is turning with the pencil.

2. Cut a 10-inch length of string and tie one end of it to the pencil, about halfway between the ruler and the point of the pencil; tape it in place.

3. Holding the string above the pencil, have kids spin the bottom of the pencil and watch what happens. The lower half of the pencil (beneath the ruler) spins in the opposite direction of the top half, illustrating the same effect of torque that, in a helicopter, would keep the body of the aircraft spinning in the opposite direction of the main rotors if the tail rotor was not there to provide a force to counteract it.

4. Here’s another illustration of torque kids can perform. Have them take a screwdriver and place the hole in the center of the plastic ruler over the shaft of the screwdriver. Holding the screwdriver upright in one hand, they can spin the ruler freely with the other hand, illustrating both spin and the torque it produces. They can also observe the behavior of a single rotor blade when the screwdriver is placed in one of the slots of the ruler, and the ruler is then spun.

EXTENSION:

Using the other materials mentioned, have kids work in teams of two to demonstrate various other forces, known as stress forces, that are involved in helicopter flight: pulling on opposite ends of a rope (tension, resistance to being pulled apart or stretched); twisting a dry towel from opposite ends (torsion, resistance to twisting); and squeezing a wet towel into as small a ball as possible (compression, resistance to being pushed together or crushed).
**ACTIVITY OBJECTIVE:** In this activity, kids have an opportunity to step up the helicopter-design ladder to simulated “powered flight” by constructing and flying a simple rubber-band-powered helicopter.

**TIME REQUIRED:** 20 minutes

**MATERIALS NEEDED (FOR EACH LAUNCHER):**
- Plastic drinking straw
- Plastic bead, just larger than the inside of the straw
- Rubber-band
- 10 inches of wire slim enough to fit through the plastic bead
- Straight pin
- Sheet of stiff paper
- Two 8-inch bamboo strips
- Clear office tape
- Glue

**WHAT TO DO:**

Assembly Instructions for Each Helicopter

- Helicopter Parts:
  Cut out four rectangular pieces of paper, each 1 by 2 1/2 inches. These pieces will form the blades of the rotor.

- Glue two pieces of paper on opposite ends of each bamboo strip. Set the angle of the rotors at a 30 degree slant from the perpendicular, slanting in opposite directions from each other. Allow 3/4 inch overlap of paper beyond the end of the bamboo strip.

- Top Rotor Assembly:
  Cut off 1 1/2 inches of wire to use in making the rotating piece for the top rotor. Bend a small, open wire loop that will fit inside the straw on one end of this wire piece. Thread the wire through the plastic bead, and then bend the wire at a 90-degree angle just above the bead. Glue the top rotor onto the wire at the top of the plastic bead. Take care to place the rotor at the exact center of the straw above the wire bead.

- Make a long hook with the remainder of the wire that will fit inside the straw. The wire hook will be used to pull the rubber-band through the inside of the straw.

- Cut a notch into one end of the straw for the bottom rotor. Slide the wire hook through the straw and pull the rubber-band through the straw until a small loop of the rubber-band is left sticking out the bottom of the straw. Press the straight pin through the straw and inside the loop of the rubber-band. Pull the rubber-band the rest of the way through the straw until it meets the straight pin. Then glue the bottom rotor into the notch and also tape it to the straight pin.

- Pull the rubber-band up until it emerges outside the top of the straw. Hook the top end of the rubber-band onto the open wire loop below the plastic bead. The assembly of the helicopter is complete. To operate the helicopter, hold the assembled unit with the thumb and index finger grasping the bottom end of the straw and bottom rotor, while turning the top rotor to twist the rubber-band inside the straw. Turn the rotor in the proper direction so that the upper edges of the rotor will be the leading edge as the rotor turns. When the rubber-band has been twisted sufficiently, toss the helicopter into the air and watch it soar!
ACTIVITY OBJECTIVE: In this activity, kids will attempt to fly the rubber-band helicopter they constructed in Activity 6.9 and control it in various ways in a series of fun “field trials” they will set up and conduct to demonstrate firsthand some of the unique challenges of helicopter (rotary) flight.

TIME REQUIRED: 20 minutes

MATERIALS NEEDED:
- Completed rubber-band helicopter (see Activity 6.9 for materials/instructions)
- String or twine
- Scissors
- Masking tape
- Electric hair dryer
- Electrical extension cord
- Hula hoops
- 4 to 8 2-liter empty plastic soda bottles, rinsed clean, with screw-on cap
- Sand or fine gravel
- Stepladder or stool
- Tent pegs
- Measuring tape

WHAT TO DO:
You can choose to conduct this activity outdoors on a grassy or paved area, or indoors within a large, open, high-ceilinged room or gymnasium. Either way, help kids plan and set up a “test course” using some of the ideas below as “stations” for the “field trials” in which they’ll put the rubber-band helicopters they constructed during Activity 6.9 through their paces. Follow or adapt the instructions below to custom-design a course that best suits the group’s needs. “Winners” of the trials can be awarded token prizes.

1. Have kids attempt to direct the flow of air from a hair dryer beneath their helicopters after launch to make them “hover” longer, or rise to hop over an object like a chair or desk.

2. Mark several 3”-square spaces on the floor with masking tape if indoors, or using string and tent pegs if outside, and have kids take turns attempting to “precision land” their choppers within those 3” inch squares from a standing position.

3. Create target landing areas of varying sizes and shapes by placing sand-filled soda bottles at desired intervals on the ground, then connecting the bottles with string tied around the bottlenecks to form the boundaries of landing areas. Then have kids attempt to land their helicopters in these target areas by launching them from a set of stairs, a ladder or some other higher point. A hula hoop can also be used in this manner.

EXTENSION:
Invite kids to suggest other tasks or obstacles that might be used to test the maneuverability and control of their rubber-band helicopters; help them collect and assemble materials to be used in the tests or obstacles, then have them conduct this additional set of “trials” themselves. They can use the tape measure to measure heights, distances, etc.
ACTIVITY OBJECTIVE: This activity challenges kids to have fun becoming “aircraft designers” who will build and test flying discs and rings (4 types of construction in all) to see which designs fly highest, fastest and farthest, just as aircraft designers do in real life. Many of the aerodynamic principles they have learned about so far (including lift, spin, drag, etc.) will come into play here.

TIME REQUIRED: 20 minutes

MATERIALS NEEDED:
- Cardboard squares
- Paper plates or recyclable plastic plates
- Compass for drawing circles
- Scissors
- Pennies or metal washers
- Glue
- Color markers
- Construction paper for decorating

WHAT TO DO:
Following the instructions below, kids will build 2 types of “flying saucers” (disks) and two types of flying rings from cardboard and paper plates. Divide the main group evenly into smaller groups so that one group makes cardboard disks, a second group builds paper plate disks, a third creates cardboard rings, and a fourth makes rings from plates, with each kid uniquely decorating his/her creation. Everyone gets a chance to fly their aircraft and observe which types fly the highest, fastest and farthest. Then discuss why those designs might have worked better than others.

1. Cardboard Flying Disk: Use the compass to draw a 10”-diameter circle onto a sheet of cardboard, and cut it out. Give your flying disk a fling and watch what happens.

2. Cardboard Flying Ring: Using the compass, draw two concentric circles (a 10”-diameter outer circle and a 6”-diameter inner circle) onto a sheet of cardboard, and cut out the ring. With a flick of the wrist, give your flying ring a fling and observe its behavior. If you like, you can try improving the ring by cutting out a second ring and gluing it onto the first one.

3. Paper Plate Flying Ring: Take a paper plate and cut the center out of it, using the line marking the bottom of the plate as a guide. Give it a whirl and watch it fly; if you wish, you can strengthen it by gluing an uncut plate upside down onto the first ring.

4. Paper Plate Flying Disk: Turn a paper plate inside out. After placing a second plate on the table upside down, mount the first (inside-out) plate atop the second plate and glue them together. Finally, glue six evenly spaced pennies or washers around the top edge. Now your disk is ready to fly; give it a spin and watch it fly!

EXTENSION:
Have kids switch types so that everyone gets a chance to make and test all four basic ring and disk designs. Additionally, challenge kids to create and test variations on these basic designs by adding (or subtracting) pennies or washers to increase/decrease the weight of the craft, changing the quantity of paper plates and/or cardboard pieces to increase/decrease the thickness of the disk or ring, etc. Have kids observe and record the effects of these variations on their disks or rings in terms of thrust, lift, drag, etc.
ACTIVITY OBJECTIVE: Aviation and rotary flight pioneer Igor I. Sikorsky always believed in the helicopter’s potential as a rescue aircraft, and ended a statement on his company’s plans to develop a production helicopter in the late 1930s with these words: “The helicopter will prove to be a unique instrument for the saving of human lives.” How right he was! In a fun way, this activity challenges participants to demonstrate how helicopters have been used to rescue countless people from emergency situations and recover American astronauts and spacecraft from the ocean after manned space missions. Kids can also explore future emergency uses for helicopters.

TIME REQUIRED: 20 minutes

MATERIALS NEEDED:
- Plastic water buckets or a small plastic wading pool
- Access to a water hose
- Rope or clothesline
- Floating tub toys, used/discard plastic action figures, plastic toy vehicles & spacecraft
- Stepladders or stepstools

WHAT TO DO:
You can choose to conduct this activity outdoors on a grassy or paved area, or indoors within a large room or gymnasium. Either way, use the following steps to help kids set up and conduct rescue “demonstration stations” or a “demonstration tank” to demonstrate simulated ways in which helicopter crews rescue people or vehicles in trouble by taking turns rescuing “victims” from the water:

1. Help kids set up “rescue demonstration stations” by placing plastic water buckets on the ground, arranged in a line or a circle, allowing several feet of space around each bucket. Or you can use a small plastic wading pool or kiddie pool as a “demonstration tank,” which kids will stand around in a circle as they take part in the demonstrations.

2. Fill each water bucket halfway with water (or fill the wading pool to a water level of only 3 or 4 inches). Toss a “victim” (a tub toy, action figure, toy vehicle, toy spacecraft, etc.) in each bucket of water, or toss several of the items into the partially filled wading pool.

3. Distributing a 4- or 5-foot length of rope or clothesline for each bucket (or for each place where kids will stand around the “tank”), have kids take turns in tying a loop at one end of the rope to use as a harness, and attempting to throw it around “victims” and “rescuing” them by pulling them out of the water.

4. The group will have a lot of fun as they attempt to become “rescue crewpersons” saving the “victims” from the water. Make sure they avoid slipping on wet surfaces. Kids who accomplish the task in the fewest tries could be awarded a “lifesaving citation,” etc.

EXTENSION:
After taking part in the “rescue demonstration,” ask kids to give examples of helicopter rescues they might have seen on television news reports, or portrayed in TV shows or movies, as well as examples of spacecraft recovery they might have seen in historical footage. Have them talk about the types of helicopters involved, the crews and rescue methods employed, the various kinds of Sikorsky helicopters used in rescue missions today, and what a typical rescue helicopter might look like 10 or 20 years in the future.
ACTIVITY OBJECTIVE: Helicopter pioneer and visionary Igor Sikorsky became fascinated by the possibility of helicopter flight as a child in Russia, and built his first working rubber-band helicopter (with two 30-inch rotors) at the age of 12! Early in his career as an aviation designer, Igor built two helicopter prototypes that didn’t quite work, but never gave up on his quest to conquer the problems of helicopter design – finally building a successful rotary craft on his third try, some 30 YEARS after his first two! This activity focuses on how Sikorsky’s legacy lives on through the many and varied uses of helicopters today, challenging kids to illustrate as many current and possible uses as they can think of by creating scenarios based on silhouettes of several types of Sikorsky helicopters.

TIME REQUIRED: 20 minutes

MATERIALS NEEDED:

• Sikorsky helicopter silhouettes
• Oversize drawing pad
• Construction paper
• Scissors
• Glue
• Color markers
• Crayons

WHAT TO DO:

Using the silhouettes of the four different types of Sikorsky helicopters pictured here as a starting point, challenge kids to create large-scale, mixed-media pictures of as many different uses for each of those helicopter types as they can think of. Have kids first enlarge and trace the basic silhouette onto construction paper and cut it out. They can then add variations and other elements, either drawn or from construction paper, for each scenario on a sheet from the oversize drawing pad.

Possible scenarios for these pictures include helicopters used for rescue at sea and in remote land areas, commuting, medical evacuation, newsgathering, traffic observation, cargo carrying, police and firefighting duty, hauling of vehicles and large equipment, military scouting and combat, troop transportation, etc. Encourage kids to use their imaginations and have fun!

EXTENSION:

Spend some time having kids share and comment on their pictures, explaining what kinds of uses they imagine might be possible for each helicopter type. You may also want to organize a special exhibit of pictures produced by kids taking part in this program, to be prominently displayed in your museum, accompanied by short descriptions of the scenes written by each artist.
ACTIVITY 6.14
BUILDING A BETTER CHOPPER

ACTIVITY OBJECTIVE: Following earlier themes of helicopter development and design, this activity challenges kids to learn how designers of helicopters and other aircraft strive to protect their craft from corrosive and harmful elements by testing various materials to develop a “hardier” helicopter model, based on one of the paper helicopters they created in Activity 6.5, “From Paper to Helicopter.”

TIME REQUIRED: 30 minutes

MATERIALS NEEDED:
To be shared by group:
- scissors
- tape
- paper clips
- pencil
- ruler
- bucket of sand
- spray bottle containing water
- portable, battery-operated box or table fan

- paper helicopter pattern (described below)
- 8 ½” x 11” sheet of plain copy paper
- 8 ¼” x 1” strip of construction paper
- 8 ½” x 1” strip of aluminum foil
- 8 ½” x 1” strip of thin sheet aluminum
- 8 ½” x 1” strip of thin plastic sheeting

WHAT TO DO:
Begin by having kids discuss possible hazards and corrosive elements that might be faced by aircraft in general, and helicopters in particular – like wind, rain, salt water from the sea, desert sand, ash from fires, etc – depending on their various uses and where they are deployed. Ask them to think about how designers protect their aircraft from these potentially damaging elements. Then challenge them to follow the directions below to create and fly “test models” of a simple paper helicopter (flutter mobile) design from Activity 6.5, using strips of the different materials provided (thin paper, construction paper, plastic sheeting, aluminum foil and aluminum sheeting).

1. Measure out and cut a strip 1” wide and 8 ½” long from the sheet of plain paper.
2. Measure 1” from each end of the strip, then cut a ½” notch on opposite sides of the strip.
3. Bending the strip over on itself, connect the two ends together by matching up the two notches and sliding them together; your basic paper helicopter is complete.
4. Holding the paper helicopter by one of its sides, drop it from the top of a set of stairs; it should flutter gently and spin as it slowly falls to the ground.
5. Now, using the strips provided, repeat steps 2 – 4 to create and fly helicopters from each material: construction paper, plastic sheeting, aluminum foil and aluminum sheeting.
6. Then work outdoors with a partner to test how helicopters made from each material hold up when flying through “wind” (from the fan), rain (sprayed by the water bottle), and sand (tossed from the bucket). Record your observations and share them with the group.

EXTENSION:
Take photos of the group conducting their tests, and display them with examples of “helicopters” from various materials and kids’ written observations in a museum exhibit chronicling the activity.
NEW! SUSTAINABILITY ACTIVITIES
Welcome to the new Sustainability Activities portion of the 5th Annual Sikorsky Helicopter 2050 Challenge binder. These activities in particular will help you come up with a sustainable, environmentally friendly helicopter of 2050!

- **Turn Down the Volume**
  Students will explore rotor shape and noise pollution.
- **Help Engines to Stop Smoking**
  Kids will explore internal combustion and its alternatives.
- **Electricity’s Shocking Challenges**
  Students will consider the challenges of using electricity to power helicopters.
- **Lose Weight to Save Gas**
  Kids will test the strength of certain materials and consider alternatives to typical materials used in helicopter construction.

When kids are ready to submit their idea(s) into the 5th Annual Sikorsky Helicopter 2050 Challenge, they may easily enter online at [www.Helicopter2050.com](http://www.Helicopter2050.com). Review the official rules on the program website. Alternately, kids may use the official entry form found at the back of this binder. They will need their parent’s permission (whether entering online or by mail). For mailed entries, kids should fill out the official entry form and mail their submissions to:

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c/o By Kids For Kids Co.  
1177 High Ridge Rd.  
Stamford, CT  06905

Good luck and happy innovating!
ACTIVITY 7.01

TURN DOWN THE VOLUME

ACTIVITY OBJECTIVE: Students will drag different-shaped model rotors through water to explore how rotor shape affects the fluid it moves through. When helicopter blades move through the air they create similar disturbances, which contribute to helicopter noise pollution.

TIME REQUIRED: 30–60 minutes

MATERIALS NEEDED:
- A wide bowl or baking dish
- Water
- Food coloring
- A variety of differently shaped objects to serve as model rotors. Try to get a range of cross-sections. You might try: a drinking straw, a flattened drinking straw, round and square chopsticks, a butter knife, etc.

EXPLANATION:
A helicopter’s rotor blades are the vehicle’s wings. They must have a certain shape to provide the lift that allows the craft to fly. These wing shapes also cause vortexes to form in the air that they move through. These vortexes are like little sideways whirlpools in the air.

As a helicopter blade spins, it creates a vortex behind it. The next spinning blade hits this vortex, which causes the blade to vibrate. This vibration is a big part of the loud noise that a helicopter makes in flight.

You probably noticed that square or flat rotor shapes created a lot of disorder in the food coloring. Tear-drop or lens-shaped rotors moved through the water more easily and made organized little swirls in the coloring; these are vortexes. Helicopter engineers are at work to reduce the vortexes made by the rotors to create quieter helicopters. The challenge is to find a shape that works like a wing to make lift, but doesn’t create the vortex-induced vibrations.

WHAT TO DO:
1. Prepare four different-shaped rotors to test.
2. Fill a wide bowl or baking dish with water.
3. Add a drop or two of food coloring to the water in the dish.
4. Quickly but steadily move one of your test rotors through the drop of food coloring in the water.
5. Observe the motion of the food coloring as the rotor blade moves through it. How does it move around the rotor? How does it move after the rotor has passed through? In your notes, draw pictures of the different movement patterns you see in the fluid.
6. Refill the dish with clean water and repeat steps 2–5 with rotors of different shapes.
**EXTENSION:**

Although most people think of dirty air or water when they think of pollution, the loud, unwanted sound of machines creates noise pollution. Have students discuss problems that might result from helicopter noise pollution, and how quieter helicopters might be useful.
ACTIVITY OBJECTIVE: Almost all helicopters are powered by internal combustion engines that burn fuel to generate power. Combustion also creates pollution by releasing soot particles into the air. In this simple activity, students will experiment with a candle to learn about combustion pollution and how to make combustion more efficient.

TIME REQUIRED: 30 minutes

MATERIALS NEEDED:
- A candle
- Matches or something to light the candle
- Two metal spoons
- A drinking straw

WHAT TO DO:
1. Light a candle. Make sure the candle is in a safe, supportive holder, and that you are in a room with no draughts so the flame is steady and still.

2. Hold a metal spoon above the candle with the flame just about touching the spoon.

3. Hold the spoon above the flame for about five seconds, then remove it. Examine the bottom of the spoon where it was in the flame. What do you see?

4. Grab a new, clean spoon and repeat steps 2 and 3. But this time, use a straw to blow against the bottom of the spoon while you hold it at the top of the flame. Make sure you blow VERY GENTLY so you don’t disturb the flame very much or blow it out!

5. Compare the bottom of the first and second spoons. What differences do you notice?

EXPLANATION:
Candles are composed of paraffin wax. The wax is their fuel. Burning the wax creates heat and light, but it also makes pollution in the form of black soot, which collects on the bottom of the spoon. The soot is produced because some of the fuel is not fully burned and is released as tiny particles. This is known as incomplete combustion.
When you blew on the bottom of the spoon, you added more oxygen to the flame, which helps the combustion reaction burn more paraffin fuel. It makes the reaction more efficient, and it produces less soot.

Internal combustion engines in helicopters also produce pollution in a similar fashion. Their fuel, like paraffin, comes from petroleum. Burning it can be inefficient and release soot in exhaust. Modern engines gulp air to burn fuel more efficiently, but engineers are always looking for ways to further increase helicopter engine efficiency, so the engines make better use of their fuel and don’t create as much polluting waste.

**EXTENSION:**

Encourage students to think of other fuel and power sources besides petroleum-based internal combustion engines that might power helicopters. Would these alternative fuels produce pollution? If so, what kinds? How would these alternative fuels/engines create power for flight?
ACTIVITY OBJECTIVE: Electricity is a clean, non-polluting source of power that could be used in green helicopters, but creating electric helicopters will require overcoming a variety of design challenges. Engineers hope to create batteries that are strong enough to power a craft but light enough to fly. In this activity, students will create their own batteries to get a sense of what obstacles stand in front of all-electric helicopter flight.

TIME REQUIRED: 1 hour

MATERIALS NEEDED:
- 5 pennies
- 5 nickels
- cardboard
- scissors
- small bowl
- white vinegar
- table salt
- light emitting diode (LED) (may be scrounged from a toy, flashlight, or ordered online)
- electrical wire

WHAT TO DO:
1. Use scissors to cut the cardboard into five small squares, about ½ inch by ½ inch.

2. Pour ¼ cup of vinegar into a small bowl and stir in a teaspoon of table salt.

3. Soak the cardboard squares in the salt and vinegar mixture.

4. Build a pile battery by placing a penny on the table, then a cardboard square soaked in the salt/vinegar solution, then a nickel, then a penny, then soaked cardboard, etc., in that order, until all of the coins and cardboard squares are used. The completed pile should have a penny on the bottom and a nickel on top. Note: The illustration above represents only a portion of the entire battery. Please use all of the pennies, nickels, etc., as listed to build your battery.

5. Connect a length of wire to each of the two leads on a LED. The longer lead is the positive, and the shorter lead is the negative on the LED.

6. Pick up your pile battery and hold the free end of the wire from the positive lead of the LED to the penny, and the wire from the negative lead of the LED to the nickel. The LED should light up. If you can't tell the positive from the negative leads on the LED, you may need to flip the wire you touch to the penny and the wire you touch to the nickel.
EXPLANATION:

Batteries are devices that use chemicals to store electrical energy, and can release that electrical energy when needed. In this simple battery, called a voltaic pile, each little penny/cardboard/nickel sandwich is a low-power battery. The vinegar solution acts as an electrolyte, which facilitates a chemical reaction that helps negative charges accumulate in the nickel, which can flow to the penny when a wire is attached. These little batteries multiply their power when they are stacked.

Electric helicopters need to have a similar process working on board to produce power to turn their rotors. Modern batteries are much stronger than the voltaic pile you just created—they use different metals and chemicals—but they work on similar principles.

If helicopters could be powered entirely by electricity, they would release no combustion-related pollution as they fly. But helicopters require a tremendous amount of power, and batteries that supply that power are often heavy and have difficulty lasting long enough for useful flight. The Sikorsky Firefly, a prototype all-electric helicopter, can fly for 12–15 minutes. As battery technology improves, engineers hope that light, strong, long-lasting batteries may one day become available to electrify future helicopters.

EXTENSION:

Students should understand that electrical power can be increased by increasing the number of penny/electrolyte/nickel cells in the battery. Have students continue the stack as outlined in Step 3. Can they make a 20-coin battery? Can they find other devices to power with their coin battery, such as a small electric display or motor?
ACTIVITY 7.04
LOSE WEIGHT TO SAVE GAS

ACTIVITY OBJECTIVE: Students will explore the tensile strength of various materials to get a sense of what might be necessary to build lighter, more efficient helicopters. If a helicopter can be made light but strong, it will require less fuel to fly.

TIME REQUIRED: 1 hour

MATERIALS NEEDED:
- A spring scale (10 kg should be good to test strong materials)
- A broomstick or other piece of strong wood to use as a handle
- A secure place to attach the scale
- A strand of hair
- A cotton thread or string
- A rubber band
- A nylon fishing line
- A thin copper wire

WHAT TO DO:
1. Attach a spring scale to a secure point, such as a strong doorknob or table-top clamp.

2. Select four materials to test. Any long, strand-like materials should work. Try a hair (natural fiber), a cotton thread (natural fiber), a rubber band (natural rubber), a nylon fishing line (synthetic fiber), and some thin copper wire (metal) to get a good variety of materials.

3. Choose a material to test. Tie one end to the spring scale and one end to a strong handle, such as a broomstick.

4. Have a friend watch the reading on the spring scale as you gently but steadily pull on the handle.

5. Pull until the material breaks. Your friend watching the scale should make a note of the force registered on the scale when the material broke. If the material is too strong for your scale, make a note of how much force it could bear.

6. Repeat steps 3 through 5 with all of the materials you have chosen. Then rank them according to how strong they are.
EXPLANATION:

Tensile strength is a measure of how resistant a material is to breaking when forces pull on it. Helicopter frames and rotor blades have traditionally included metal, which has a high tensile strength but is heavy. Heavy helicopters take a lot of fuel to fly. Plastic, like nylon, is light but not strong enough to withstand the forces of flight in a full-sized helicopter.

Helicopter designers strive to find new materials that are as light as plastic but as strong as metal. Carbon fibers offer one possible solution. They can be made thinner than a hair and remain stronger than metal. One day, plastics reinforced with something like carbon fiber might be used to replace metal in the construction of light, fuel-efficient helicopters.

EXTENSION:

Ask students to list the parts of a helicopter that might currently be constructed of metal, and that might be replaced by lightweight materials. What kinds of forces affect these components? Brainstorm some materials that might replace metal in a helicopter.
LEANER & GREENER ‘COPTERS ACTIVITIES
Welcome to the guide to the Leaner & Greener ‘Copters portion of the 5th Annual Sikorsky Helicopter 2050 Challenge. These activities will help participants learn about environmental aspects of helicopters.

Follow the guide below to find information on each activity in the “Leaner & Greener ‘Copters” section of this program. These activities will guide the participants through a fun and engaging environmental helicopter ride into the future!

- It’s All about Energy
  Kids will learn about current and alternative helicopter energy sources and consider ways to reduce emissions and overall environmental impact.

- Cool ‘Copters for a Better World
  Kids will use their imagination and role-play to come up with ways helicopters could be used to protect, conserve, and positively contribute to the environment.

- A Tunnel of Fun
  A model wind tunnel will help kids learn some basic principles of how aerodynamics can effect and potentially reduce drag to improve fuel efficiency and make a helicopter “greener.”

- Building a Leaner, Greener ‘Copter
  In this activity, kids will learn about materials used in modern helicopters and consider alternative materials that may be more eco-friendly.

- Turn Old into New Again
  Following the principles of the three “R’s” of recycling, kids will consider how to reduce, reuse, and recycle modern and future helicopters.

When kids are ready to submit their idea(s) into the 5th Annual Sikorsky Helicopter 2050 Challenge, they may easily enter online at www.Helicopter2050.com. Review the official rules on the program website. Alternately, kids may use the official entry form found at the back of this binder. They will need their parent’s permission (whether entering online or by mail). For mailed entries, kids should fill out the official entry form and mail their submissions to:

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1177 High Ridge Rd.
Stamford, CT 06905

Have fun thinking about the helicopters of the future!
ACTIVITY OBJECTIVE: In this activity, kids consider how to help conserve energy resources and reduce emissions and other environmental impacts by identifying possible alternative energy sources that can be developed to power helicopters.

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Notepad (for “brainstorming” ideas)
- Drawing or sketch pad (for designs/illustrations of alternative-energy helicopters)
- Pencils, markers, etc.

WHAT TO DO:
Begin by having kids talk about where the fuels used in most aircraft, automobiles, trucks, diesel-powered trains, etc., come from – concluding that they are generally petroleum (oil)-based, so are considered non-renewable “fossil fuels.” Background information on fossil fuels and other energy sources is provided in the “Background on Energy Sources” section of this activity and can be read or distributed to kids. Ask kids to give reasons why it’s important to develop “greener” alternatives to fossil fuels to satisfy the world’s energy needs, from electric power in homes and businesses to fuels used for transportation, and discuss what some of those alternatives might be.

Now, have them focus on helicopters, asking them to think about alternative energy sources that might be practically applied to powering these versatile aircraft; five possible examples are listed below. Then break the group up into five smaller teams and assign each team to “brainstorm” about one of the listed possible fuel alternatives, considering whether the source might be made to work in a helicopter; we’ve also provided some questions to get their brainstorming started.

Possible Alternative Energy Sources:
- Hydrogen
- Biofuels
- Synthetic/hybrid fuels
- Solar/electric power
- Nuclear power
“Brainstorming” kick-starters:
1. What are the pros & cons of this energy source?
2. Can the energy source be harnessed safely? Has it been used in other applications?
3. Has an engine been developed that can use energy from this source? If so, would such an engine be practical for use in a helicopter?
4. Is this energy source available for widespread use now? If not, could it be made readily available in the future?
5. Would using this energy source for helicopters be cost-effective?
6. What kind of emissions could be created by using this energy source; could the source be considered “green”?
7. Has using this energy source for helicopters ever been attempted? Was it successful?

Then, after all the teams have had a chance to brainstorm and take notes, bring everyone together to discuss the pros, cons and possibilities of each alternative energy source – and ask kids to suggest other potential sources to discuss as well. Then have the group choose the two likeliest alternative energy sources for helicopters, and challenge them to create design drawings that show what helicopters using these energy sources might look like.

**EXTENSION:**
If your facility has available computers and Internet access on-site, the kids can do brief, on-the-spot web searches for information about their energy source to help in their “brainstorming”; we’ve also provided background information on each source and its possible helicopter applications in your presentation materials.

Challenge teams to build simple wood models of their best alternative-energy-helicopter designs, or modify existing plastic scale helicopter model kits to build models of their creations.

**BACKGROUND ON ENERGY SOURCES:**
Each type of energy has a different power density, or amount of power per unit volume. Renewable forms of energy generally have a much lower power density than fossil fuels. An energy source with lower power density ultimately weighs more and takes up more space in the thing it fuels. In contrast, an energy source with higher power density ultimately weighs less and takes up less space in the thing it fuels. As you think about the environmental helicopter of the future, keep this in mind. It will help you get a better sense of the challenges involved with creating a maneuverable, comfortable, safe, and environmentally friendly helicopter.

**Fossil Fuels:** Fossil fuels are natural sources of energy such as coal, gas, or petroleum (oil). Their name comes from the fact that they were formed in the geological past from the remains of plants and animals. Most of the energy sources currently used in cars, planes, trains, and helicopters are fossil fuels. Of these, one is currently the main energy source: petroleum. Even though these energy sources are “natural,” using them can cause air pollution and may cause climate change. Plus, these energy sources are finite – meaning, they only exist in a limited amount and will eventually run out. These types of energy tend to have higher power density than renewable energy sources.
**Hydrogen:** A personal (single-seat) helicopter called the Dragonfly, weighing just 230 lbs., successfully flew on a fuel combination of hydrogen peroxide and a catalyst, with "zero emission" (i.e., creating only water vapor as a bioproduct) in 2010. With a speed of 100 knots and carry payloads of up to 800 lbs, the aircraft can remain aloft for 90 minutes.

**Biofuels:** With grant funding from the U.S. Dept. of Energy – which has set a target to produce 21 billion gallons of biofuels by 2022 as part of an effort to help America become greener – the Forest Bioproducts Research Initiative at the University of Maine has joined with private-sector partners to launch a pilot biorefinery program to produce cellulosic bio-butanol from wood pulp as a possible fuel for helicopters.

**Synthetic/hybrid fuels:** In 2010, a flight demonstration test conducted at the U.S. Army's Redstone Test Center in support of U.S. Air Force research efforts proved the viability of using an alternative synthetic fuel in rotary aircraft, by flying a Sikorsky UH-60 Black Hawk helicopter powered by a fuel mix of 50% coal and 50% jet fuel.

**Solar/electric power:** Experimental solar-powered aircraft have been flying since the mid-1970s; in May 2012, the jumbo-jet-sized Solar Impulse airplane, propelled by electric motors that run on solar power collected by over 11,000 solar panels, embarked on a trans-European flight. In the rotary aircraft field, in 2010 Sikorsky Innovations unveiled Project Firefly – an all-electric, technology demonstration helicopter based on the Sikorsky S-300C, but with a high-efficiency electric motor using power stored in lithium ion battery packs. Something to consider: solar cells have very low power density, so they add a lot of weight and take up a lot of space.

**Nuclear power:** Between the mid-1940s and early 1960s, both the U.S. and the Soviet Union experimented with nuclear-powered military aircraft designs, but neither ever created an operational nuclear aircraft. The need to shield crews from radiation sickness, along with other inherent dangers involved in operating a nuclear reactor in an aircraft, made workable designs impractical, although an operational nuclear-powered aircraft engine was actually produced by the U.S. in 1956. At least one huge nuclear rotary aircraft design – a 300-foot-long, 250-ton nuclear-powered, double-deck, twin-rotor helicopter with a top speed of 200 mph – made it to the drawing board around 1960, but was never built. Nuclear power has tremendous power density, but needs to be supported by a lot of extra machinery and complexity to make it somewhat safe to use.
ACTIVITY OBJECTIVE: Here, kids use their imaginations and role-playing abilities to think of and act out new or existing ways in which helicopters and their designers and/or crews can be employed to help protect, conserve and create a positive impact on the environment. This will help kids come up with ideas for a sustainable, environmentally friendly helicopter of 2050.

TIME REQUIRED: 30-45 min.

MATERIALS NEEDED:
- Notepad (for “brainstorming” ideas)
- Pencils, markers, etc.

WHAT TO DO:
Start the activity by referring to the helicopter’s important ongoing role in rescuing people after accidents, fires and natural disasters, evacuating the wounded in times of war, etc. Then ask kids to think about ways helicopters might be used to help preserve the environment, too – either directly, by performing operations aimed at protecting wildlife or natural resources, or by providing “greener,” eco-friendly alternatives for a range of transportation challenges.

Listed below are several categories in which helicopters might be put to environmentally positive use (you may also want to encourage kids to suggest some more of their own). For each one, challenge kids to come up with a specific example of how helicopters might be employed to help in that area (we’ve provided one example in each area to get them started). Then, for each example, have teams of kids work together to discuss and then improvise a role-playing exercise based on that “scene.” (Examples: Portraying the crew of a helicopter “airliner,” or a team of naturalists tracking endangered koalas in Australia using a drone helicopter, etc.)

‘Copters For The Environment
1. Energy Conservation
   (Example: Conserving energy by employing helicopters instead of airplanes for passenger or commuter air travel)

2. Low-Impact Wildlife Management
   (Example: Using helicopters to keep track of endangered animal populations, or gather herds of wild horses in the West, etc.)

3. Environmental Protection/Land & Water Conservation
   (Example: Monitoring water and land resources within public lands by helicopter; taking aerial photography and videos to create highly detailed maps for erosion, flood mapping and other land management purposes)

4. Disaster Remediation & Recovery
   (Example: Fighting and controlling forest fires and wildfires by helicopter; using helicopters to deliver aid and recovery teams to stricken areas after tornadoes, hurricanes, floods, etc.)
**ACTIVITY 8.02**  
**COOL ‘COPTERS FOR A BETTER WORLD**

**5th ANNUAL**  
**HELIICOPTER 2050**  
**CHALLENGE**

Other Ideas:

5. ________________________________

6. ________________________________

**EXTENSION:**

Have kids use the Internet to research other ways in which helicopters can be used in the interest of protecting and conserving the environment; a good place to start might be the websites of state environmental agencies, as well as federal agencies like the Environmental Protection Agency, the National Park Service and the Bureau of Land Management.

**WEBSITES TO EXPLORE:**


United States Environmental Protection Agency: Students for the Environment, http://www.epa.gov/students/
ACTIVITY 8.03
A TUNNEL OF FUN

ACTIVITY OBJECTIVE: By having kids construct and use a simple model wind tunnel, this activity demonstrates how helicopter designers can test and then modify the shape and aerodynamics of an aircraft (in this case, a model helicopter), in order to decrease drag (a principle demonstrated in several other activities in this program), therefore theoretically improving fuel efficiency and making the ‘copter “greener.”

TIME REQUIRED: 45-60 min.

MATERIALS NEEDED:

- A 4-ft. (48") length of Sonotube® or similar cardboard or fiber concrete-forming tube, 8”–10” in diameter (available at home-improvement stores)
- A piece of transparency film, acetate or other transparent material (for the tunnel window)
- A small electric fan (box-style or round)
- “Honeycomb” light cardboard separators from an egg carton (these are often available from a grocery store, bakery, or restaurant; you can also build your own from strips of light cardboard)
- A sturdy cardboard box the same size as the egg carton separators (or pieces of heavy cardboard to build an enclosure for the fan)
- Book tape or duct tape
- String or twine
- A few strong rubber bands
- 2 small hooks (cup hanger hooks)
- 2 notebook paper reinforcement rings
- A utility knife (for cutting a window in the tube, under adult supervision)
- Several model helicopters (either plastic scale models or the paper models made in other activities of this program can be used)

WHAT TO DO:

At the heart of this fun, hands-on activity is a simple model wind tunnel that you (as facilitator) can build prior to the activity, or let kids build themselves with your help and supervision. The kids will then use the model wind tunnel to demonstrate the effects that forces like drag have upon a helicopter and its flight characteristics.

There are numerous designs for small model wind tunnels that you can construct, but the one suggested here is relatively simple and requires minimum materials; if you wish to build and use a more sophisticated model tunnel, you can easily find other designs on the Internet. This simple cylindrical tunnel is powered by a small household fan enclosed in a box, uses cardboard egg separators to serve as an airflow straightener, and includes a window for viewing the tests. After you've constructed it according to the instructions below, have the group break into small teams and take turns using the tunnel and observing the results.
BUILD YOUR OWN WIND TUNNEL

1. Open the egg carton separators and strengthen the corners with tape.
2. Open the cardboard box at both ends, and place the separator grid into the box; make sure that the box and grid fit snugly.
3. Cut a window near one end of the tube and cover it with the clear film or acetate; tape the film down using the book binder or duct tape.
4. Fasten the cup hooks on opposite sides of the tube so that a model aircraft hanging from the top hook will be positioned in front of the window.
5. Set the egg carton separators flush against the tube, and place a fan in the box holding the separators, with the front of the fan facing into the tube; the separators will straighten the swirling air coming from the fan.
6. Fashion a suspension system for the models to be tested. Here’s one idea: Take a strong rubber band (like the kind used for rubber-band-powered model airplanes), and cut it in one place; string the two notebook paper reinforcement rings on the rubber band and glue together; tie the cut ends of the rubber band back together again.
7. Secure the model helicopter to be tested to the tunnel by attaching the rubber band assembly to the model near the model’s center of gravity, then attaching the assembly to the upper hook; attach a similar rubber band assembly to the lower hook.

NOW... LET'S TEST SOME MODEL ‘COPTERS!
Divide the group into smaller teams and have the kids gather models of several different types of helicopters, as well as some of the paper models made during other activities. Teams can then take turns using the model wind tunnel to demonstrate how airflow creates drag and other forces that affect rotary aircraft, then record their findings.

EXTENSION:
Suggest that kids research some of the other model wind tunnel designs available on the Internet – as well as other uses for wind tunnels in real life (testing everything from aircraft in development to rockets to advanced automotive designs). Then encourage them to test other kinds of models in the wind tunnel, perhaps including model airplanes, rockets, Pinewood Derby-type cars, etc.
ACTIVITY OBJECTIVE: The purpose of this activity is to get kids thinking about – and “testing” and working with – some of the materials used in modern helicopters and the environmental challenges they face (i.e., from wind, erosion and other natural forces).

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Examples of items made from the following materials (which are commonly used in modern helicopters):
  - Kevlar (non-stick cookware, tennis racket)
  - Titanium (jewelry – possibly a ring, golf club, other sporting goods)
  - Aluminum (cooking utensils, cookware, tools)
  - Carbon-fiber-reinforced polymer (CFRP) or carbon-fiber graphite composites (fishing rod, tent pole, hockey stick, pool cue)
- Bucket or similar container of sand (for use in “materials testing”)
- Spray bottle containing water (for use in “materials testing”)

WHAT TO DO:
Begin by having kids think and talk about the types of materials used in modern helicopter components: Kevlar, titanium, aluminum, CFRP, and carbon-fiber graphite composites. Contrast use of these materials with use of less eco-friendly materials like steel, which can cause air and water pollution and deplete the Earth’s supply of iron. Encourage kids to think about how materials currently used might respond to forces like wind, rain and erosion and reduce the helicopter’s operational weight. Talk about how using these “greener” materials may extend the life of a helicopter and its parts, increasing their efficiency, and ultimately reducing their negative impact on the environment.

Next, with your help and supervision, have kids gather items made from aluminum, titanium, Kevlar, graphite fiber or CFRP, using the information below as a guide.

Leaner, Greener Materials
- Carbon-fiber graphite composites or carbon-fiber-reinforced polymers (CFRP):
  These very strong and light fiber-reinforced polymers (plastics) containing carbon fibers are used in many applications calling for a high strength-to-weight ratio and superior rigidity, and can be found in components of racing cars, sailboats, bicycles, motorcycles, laptop computers, fishing rods, tent poles, hockey sticks, golf clubs, pool cues and more.
- Aluminum:
  The third most abundant element on Earth, this naturally occurring, low-density metal and its alloys have long been known for their resistance to corrosion and their light weight (as compared to iron or steel), and are commonly used in many forms of transport (in cars, trains, aircraft, boats, etc.), construction (doors, windows & other structural elements), and for countless consumer items, from watches to cooking utensils. Also, aluminum is theoretically 100% recyclable, making it important to efforts for a "greener" world.
**Kevlar:**
A high-strength synthetic fiber developed in 1965, commonly used in items such as body armor for military and law enforcement, bicycle tires, racing sails, drumheads, tennis rackets, motorcycle protective gear, non-stick frying pans, etc.

**Titanium:**
This element is an extremely strong, low-density metal used to produce strong, lightweight alloys for aerospace and military applications (jet engines, missiles, and spacecraft), automotive components, and a wide range of products from medical prostheses and dental instruments to jewelry, sporting goods, mobile devices and more.

**Putting Them To The Test:** After items have been gathered and put into categories based on the materials they represent, set up a few desks or tables as “testing stations” where kids will conduct simple tests to observe certain properties of the items (and, indirectly, of the materials they’re made from). Have the kids divide into smaller teams. Each table can serve as a “station” for conducting a different test (from among those described below), and teams can cycle through the stations so that all the items can undergo all the tests. Then help the teams, recording their results in a notebook. Be sure to caution kids to be careful not to damage the items as they conduct their tests.

Here are a few examples of tests kids can do: Test the strength and flexibility of an item by pushing or bending it gently (being careful not to break it); test resistance to liquids by spraying the item with water from the spray bottle; test resistance to erosion by pouring sand from the bucket onto the item and observing the results, watching for any damage or weakness in the item. When they’re finished with all the tests, have each team share and discuss their findings with the rest of the group.

**The Next Step:** Ask kids to think about how different materials might improve upon or replace the materials currently used to build helicopters. Have kids suggest and if possible bring in examples of other “cutting-edge” materials that might someday be used to make modern helicopters “leaner and greener” – in other words, make them operate more efficiently so they’ll have a more positive effect on the environment.

**EXTENSION:**
As designer and builder of some of the world’s finest helicopters for both military and civilian use, Sikorsky Aircraft needs to use the strongest, lightest, highest-grade and most efficient materials in its rotary aircraft, because lives literally depend on the performance and reliability of every helicopter that takes to the skies. Have kids visit the Sikorsky website to research what kinds of materials are currently being used in Sikorsky helicopters, and how they will help save energy and resources.

http://www.sikorsky.com/Innovation/Technologies/Firefly+Technology+Demonstrator

http://www.sikorsky.com/About+Sikorsky/Timeline
ACTIVITY OBJECTIVE: The purpose of this activity is to have kids consider the “three R’s” of conservation – reduce, reuse and recycle – as they apply to the manufacture, use, reuse and resource conservation of modern helicopters and their parts.

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
• Notepad
• Drawing pad or paper
• Pencils or markers

WHAT TO DO:
Set up the activity by asking kids to name, define and review the 3 R’s of materials conservation – reduce, reuse and recycle – then give examples of the 3 R’s that they might practice themselves at home (like recycling of plastics, paperboard, etc.) or see in action in their schools and communities.

Next, transition into a discussion of the role that the 3 R’s might play in terms of helicopters in general by having kids study the diagram below, with lines pointing to some major parts or systems of a typical modern helicopter. Challenge them to match the words in the word bank with the areas pointed out on the diagram, as you write in the answers they give – which will in turn get them thinking about what other uses those parts or systems might have after the operational “life” of the helicopter is over.

Word Bank:
• Cockpit
• Engine, Transmission, Fuel, etc.
• Landing Gear
• Main Rotor Blade
• Rotor Mast
• Tail Boom
• Tail Rotor

Basic Parts of a Helicopter © HowStuffWorks
Finally, after kids are familiar with the major parts of a typical helicopter – and have talked a bit about some of the source materials that might be used in those parts – set up a friendly “competition” in which kids are challenged to offer innovative suggestions for the reuse and/or recycling of such parts from “old” helicopters that have reached the end of their operational cycle and are ready for “retirement.”

Challenge kids to come up with clever, eco-friendly and perhaps humorous new “careers” for these parts and materials – for which they might write brief descriptions and perhaps create illustrations.

**EXTENSION:**
Following up not only on this activity but on the “leaner and greener” discussion in Activity 4, challenge kids to “brainstorm” about how helicopter parts might be pre-engineered for future use or reuse by creating them from more easily recyclable, innovative and “leaner and greener” materials to begin with.
GOIN' GLOBAL ACTIVITIES:
Welcome to the guide to the “Goin' Global!” portion of the 5th Annual Sikorsky Helicopter 2050 Challenge. These activities will help participants learn about global challenges, such as climate change, and consider how a helicopter of the future might help the world address and overcome these challenges.

Follow the guide below to find information on each activity in the “Goin' Global!” section of this program. These activities will guide the participants through a world-improving helicopter ride into the future!

What Are Global Challenges?
Kids will consider some major global challenges and then think about how helicopters do—and might in the future—play a role in helping to overcome them.

Rising to the Challenge
In this activity, kids will think about why and how helicopters might be well-suited to helping address global challenges.

Education, Helicopters, and the Future
Kids will consider how a lack of access to education may contribute to global challenges; then, they’ll think about how helicopters might improve access to education around the world.

The Right ‘Copter for the Job
The final activity in this section will ask kids to think about how specific types of helicopters address specific types of challenges. The activity will also explore how existing helicopter designs might be modified or improved to better suit them to a particular task or need.

When kids are ready to submit their ideas for the 5th Annual Sikorsky Helicopter 2050 Challenge, have them use the official entry form found at the back of this binder or enter online at www.Helicopter2050.com. Please review the official rules online. Kids will need their parent’s permission to enter. Participants should submit their entries online or mail their submissions to:

Sikorsky Helicopter 2050 Challenge
c/o By Kids For Kids Co.
1177 High Ridge Rd.
Stamford, CT 06905

Have fun thinking about and creating helicopters that will help overcome global challenges!
ACTIVITY OBJECTIVE: In the initial activity for this section of the binder, kids will consider some major “global challenges”—conditions or events that threaten the health, well-being, prosperity and quality of life of human beings and animals around the globe. This activity will set up the next activity’s discussion of how helicopters could (or in some cases already do) play a role in overcoming these challenges.

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Notepad (for brainstorming)
- Pencils, markers, etc.

WHAT TO DO:
Begin by asking kids what the phrase “global challenge” means to them. Have them consider what sorts of conditions or events might adversely affect the well-being, health and quality of life of people and animals around the world. Possible responses (several of which are discussed in more detail below) may include:
- Long-term poverty and hunger
- Famine due to lack of sustainable agriculture (which may have natural and/or man-made causes)
- The effects of natural disasters such as earthquakes, tsunamis, hurricanes, typhoons, floods, volcanic eruptions, draught, wildfires, etc.

Next, ask participants to give examples of some of the global challenges that currently exist in the world today (including those that may have existed in the recent past). Then, have kids talk about some of the actions that governments and aid organizations might undertake to help overcome or prevent these challenges now or in the future. Next, ask for examples of actions taken to overcome these challenges, like transporting important things—such as emergency supplies, disaster teams, equipment, and other help—to affected areas.

Finally, for each challenge and corresponding action discussed, ask kids to suggest some specific obstacles that would need to be overcome to achieve desired goals, and possible ways of overcoming those obstacles. Obstacles might include:
- Negotiating difficult terrain that might prevent delivery of aid to inaccessible areas
- Safely moving personnel and equipment through a zone plagued by armed conflict
- Clearing rubble from damaged areas after an earthquake so that rescue and recovery missions can begin

EXTENSION:
If your facility has computers and Internet access on-site, kids can do web searches for information about some of the global challenges discussed in this activity—perhaps working in groups to create a short “newscast” with video and pictures about a recent example of a global challenge and the response to it. Depending upon the age and needs of the children, you may wish to guide their Internet searches and/or limit them to specific challenges.
ACTIVITY 9.01
WHAT ARE GLOBAL CHALLENGES?

BACKGROUND ON GLOBAL CHALLENGES:
1. Fighting poverty and hunger in 3rd world or hard-to-reach areas
   Needs:
   • Deliver food to areas of famine
   • Deliver supplies, equipment, tools, and training to help people in area become self-sustaining
   • Deliver ongoing support once initial needs have been met

2. Getting drinking water to 3rd world or hard-to-reach areas
   Needs:
   • Supply drinkable water to areas where it is in short supply due to geographical location or draught
   • Deliver supplies, equipment, tools, and training to develop water delivery systems and irrigation for crops

3. Responding to natural disasters and areas with man-made conflict
   Needs:
   • Supply immediate food, drinkable water and medical supplies to areas affected by earthquakes, tsunamis, floods, hurricanes and/or armed conflict
   • Transport rescue personnel and equipment to recover and assist victims
   • Aid the injured and prevent outbreaks of disease
   • Transport equipment and staff to help communities rebuild

4. Firefighting and wildfire control
   Needs:
   • Supply water and firefighting supplies and personnel to areas ravaged by wildfires
   • Transport equipment and staff to help affected communities construct firebreaks and rebuild
ACTIVITY 9.02
RISING TO THE CHALLENGE

ACTIVITY OBJECTIVE: Building upon the discussion of global challenges in the previous activity, this activity will ask kids to consider why helicopters might be well-suited to play a role in helping to overcome the effects of some of those global challenges. Kids will consider how helicopters are—and might be—deployed to assist in such situations.

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Notepad (for brainstorming)
- Pencils, markers, etc.

WHAT TO DO:
Having established and discussed a number of key global challenges in the previous activity, start this activity’s discussion by asking kids to recall some of these challenges. Have them talk about the great efforts often required to respond to many of these challenges—like the need to:
- Deliver large quantities of food, water and medical supplies to people in need
- Locate and carry injured victims to safety
- Rescue survivors from life-threatening situations
- Transport teams of first-responders, vehicles, and equipment to affected areas
- Provide the heavy equipment needed to clear tons of debris, etc.

Next, talk about what these efforts have in common, including:
- The need to transport people and animals to/from remote, dangerous or devastated locations (on water or land)
- The need to transport supplies to these difficult-to-reach areas

Ask kids to suggest reasons why helicopters might be particularly helpful in situations like these. Continue with a discussion of examples of missions for which helicopters are ideally suited, and in many cases have been specifically designed, to carry out—and have been frequently used for since their introduction in the first half of the 20th century.

1. Fighting poverty, hunger, or famine
2. Combating drought and/or a lack of safe water for drinking and farming
3. Responding to a natural or man-made disaster; and
4. Fighting and preventing fires, including wildfires in vast, forested areas to large-scale fires in more densely populated urban and suburban areas.

Challenge each team to brainstorm and come up with as many examples as possible of specific ways in which helicopters can be deployed to rise to the challenge and help respond to the stated global challenge (see below for possible responses).

EXTENSION:
Challenge kids to work in teams to research photos, archival film/video, and supporting text to create a brief historical presentation (perhaps a slideshow or a PowerPoint presentation) on how helicopters have been helpful in
meeting global challenges from the earliest days of rotary flight to the present day—including search and rescue, firefighting, responding to natural disasters, peacekeeping, etc. The presentation might take the form of a timeline, with sections focusing on individual decades and showing the progression of helicopter design, capability, and implementation over the years.

**POSSIBLE BRAINSTORMING RESULTS FOR EACH CHALLENGE AREA:**
Below are examples of ways helicopters may help address or overcome specific global challenges.

1. **Fighting poverty, hunger, or famine**
   Helicopters could:
   - Assist in airlifting large quantities of food, water, and supplies to sustain impoverished areas suffering from great hunger or famine
   - Deliver equipment and supplies to support building and agriculture to help communities raise their own food
   - Dust crops with pesticides and fungicides and spread fertilizer by air to assist in agricultural efforts
   - Transport training and educational staff who can help communities develop their own systems for continued growth

2. **Combating draught and/or a lack of safe water**
   Helicopters could help in:
   - Airlifting sufficient quantities of safe, drinkable water to meet immediate needs
   - Delivering desalination and water purification systems and/or irrigation equipment and supplies
   - Transporting staff who can help communities develop these systems

3. **Responding to natural or man-made disasters**
   Helicopters could airlift in all kinds of supplies to meet immediate needs, including:
   - Food
   - Water
   - Medical supplies
   - Tools and building materials
   - Portable medical facilities and staff
   **They could also:**
   - Airlift the injured to distant, better-equipped medical facilities
   - Deliver equipment and staff to set up camps and temporary housing for the displaced

4. **Fighting and Preventing Fires**
   Helicopters could:
   - Help in fighting live fires in remote or urban areas from the air with water
   - Airlift “smokejumpers” and other personnel needed to fight wildfires and keep them from spreading
   - Deliver portable medical facilities if needed
   - Deliver temporary housing for people and animals displaced by fires
ACTIVITY OBJECTIVE: In this activity, kids will take a look at how the lack of access to education in many parts of the world—and even in some parts of the United States—contributes to many of the global challenges we face. This will lead to a discussion of how better access to education around the world can foster improved health, well-being, prosperity, and quality of life around the world. It will conclude with considering how some of those improvements in educational access might involve helicopters.

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Notepad (for brainstorming ideas)
- Poster board
- Pencils, markers, etc.

WHAT TO DO:
Start this activity by asking kids to once more revisit the phrase “global challenge.” Have them consider that a lack of access to education—especially in developing or “third-world” nations—might indeed qualify as a global challenge. A lack of access to education can directly or indirectly prevent small and large populations from leading healthy, happy, and productive lives.

Have kids think about and suggest ways in which inadequate education and a lack of educational access and resources might contribute to a whole range of other global challenges we’ve talked about earlier, including:
- Long-term poverty
- Hunger and lack of sustainable agriculture
- Natural disasters and their effects
- The spread of disease due to inadequate sanitation and ignorance of safe practices
- Man-made disasters like industrial accidents and armed conflict

Next, ask participants to give examples of ways in which increased access to education might prevent or help overcome some of these challenges (examples are provided in the “Background” section below). This can lead into a discussion of how helicopters might play a role in providing more—and better—access to education around the world.

EXTENSION:
Challenge kids to create posters, public service announcements, or other communications promoting education as a way to combat and overcome global challenges like hunger, homelessness, etc. Kids may also spotlight the possible roles of helicopters in overcoming such challenges.
BACKGROUND ON EDUCATION’S ROLE IN PREVENTING GLOBAL CHALLENGES:

1. **Fighting poverty, hunger, and famine through education**
   Education is integral to helping people in impoverished areas help themselves by becoming self-sustaining. Educational outreach can be carried out by teams brought in by helicopter that can help get education and training started and then deliver and provide ongoing support.

2. **Education regarding clean water and preventing disease**
   Educating adults and children about proper hygiene and how to make drinking water safe can save thousands of lives through the prevention of waterborne and other diseases. Helicopters can assist in these efforts by delivering educators and the supplies they need to establish safe practices in communities.

3. **Better response to natural and man-made disasters through education**
   The better educated a population is, the more effective their recovery from disasters like earthquakes, floods, hurricanes, etc., will be. The people will likely be better prepared and will better comprehend emergency instructions from authorities. Also, a better-educated population could produce more doctors to serve the region. Helicopters could serve as flying clinics in which disaster victims would receive treatment.
ACTIVITY OBJECTIVE: Drawing upon the discoveries made in the previous activities, the final activity in the “Goin’ Global!” section will have kids examine how the size, classification, and design of a helicopter can help determine the way it might be deployed to address specific global challenges. The activity will also explore how existing helicopter designs might be modified or improved to make them better suited to a particular task (or range of tasks).

TIME REQUIRED: 30 min. (or more if desired)

MATERIALS NEEDED:
- Sikorsky helicopter diagrams (included)
- Drawing pad
- Pencils, markers, etc.

WHAT TO DO:
Begin this activity by briefly reviewing with kids some of the tasks that helicopters regularly perform in responding to global challenges we’ve discussed in the previous activities, including:
- Delivering large quantities of food, water, medicine and other supplies to people in need, perhaps after a natural disaster
- Locating and carrying injured disaster victims, accident survivors, etc., out of harm’s way
- Transporting first-responders and their equipment to affected areas
- Providing education to areas in need

Then ask them to think about and discuss what characteristics particular helicopters would have to have to effectively perform some of these jobs. For example:
- Hauling heavy equipment or prefabricated shelters would require a large, heavy-lifting, “flying crane” type of helicopter
- Carrying large quantities of food or supplies would take a heavy-duty transport helicopter
- A medium-transport/utility helicopter would be ideal for such tasks as marine search and rescue and medical evacuation
- Duties such as crop-dusting, fire-spotting and aerial reconnaissance would require a nimble, lightweight helicopter

Now, have participants take a good look at the four helicopter diagrams provided here, each representing a different size/type of helicopter. For each one, have kids:
1. Make a list of possible global-challenge related tasks which that helicopter-type might be effective for; and
2. List (and perhaps illustrate) some modifications that they think might help the helicopter do a particular job even better. Participants can then share their ideas and work with the rest of the group.
EXTENSION:
Challenge teams of kids to search the web and other sources for recent photos and videos depicting helicopters being deployed in response to some of the global challenges we’ve discussed. They should be able to find examples of helicopters in action in search and rescue missions, delivering emergency supplies and equipment, performing medical evacuations, etc. Suggest that they arrange the results of their research into groups representing light, medium, heavy, and flying-crane helicopters (using the examples and diagrams in the activity as a guide). Then, help them create a slideshow or photo album illustrating the important role that each of these three general types of helicopters play in meeting a wide range of global challenges.

BACKGROUND:
Below is some brief information on the four types of helicopters depicted above:

1. Flying cranes—like the heavy-lift Sikorsky S-64 Skycrane—can transport heavy equipment, prefabricated shelters and other large, heavy cargo; when fitted with large-capacity tanks, the S-64 is also used by many forest services to dump large amounts of water to combat wildfires.

2. Heavy-lift transport helicopters—such as the Sikorsky S-65—are among the larger rotary craft in modern fleets, and can transport as much as 15 tons of cargo or scores of personnel.

3. Medium-transport/utility helicopters—like the Sikorsky S-92 families—are versatile craft used for a wide variety of applications, from search and rescue and medical evacuation to firefighting and transporting personnel, equipment, and cargo.

4. Light-utility helicopters—such as the Sikorsky S-434—are ideal for a range of tasks, including crop-dusting, fire-spotting, aerial reconnaissance, training, and search and rescue.
SIKORSKY’S MISSION: “We pioneer flight solutions that bring people home everywhere...everytime™.”

UP, UP AND AWAY ACTIVITIES
Welcome to the guide to the Up, Up and Away invention portion of the 5th Annual Sikorsky Helicopter 2050 Challenge. These activities will help participants develop their ideas for the sustainable, environmentally friendly helicopter of the future to submit in the Challenge.

As the facilitator, you can guide your participants through the process of discovering and identifying problems, determining solutions, designing their innovative helicopter around those solutions, refining their design and even coming up with a creative and expressive name!

The activities included in the Up, Up and Away section give kids the opportunity to create, invent and design the helicopter of 2050. Kids will be asked what it will look like, what it will be used for and how it will be powered. They can:

• Look at existing helicopters and determine problems that might limit use in the future
• Develop creative new ways to use helicopters
• Decide how the future helicopter might be fueled
• Create a new and exciting look for the helicopter
• Come up with innovative materials that could be used to build a helicopter
• Create their design and use the activities to change and refine it

ACTIVITIES
Use the activities here to begin the Up, Up and Away section. These activities will guide the participants through a fun and engaging helicopter ride into the future!

1. Brainstorming & Identifying Problems
Here are some ideas for getting the creative juices flowing:

• Using an easel pad or a white board, ask the kids to help list all the uses they know of for helicopters – rescues, military use, traffic reporting, fire fighting... are there others?
• Then ask the kids to help list all the unique qualities that helicopters have that allow them to do what airplanes can’t do. You can go to the Sikorsky website to see the development timeline of Sikorsky helicopters: http://www.sikorsky.com/About+Sikorsky/Timeline. You can also view images online of various helicopters at: http://www.sikorsky.com/Products/Image+Gallery
• Talk about some of the innovations already in the works – “Firefly Technology” – Sikorsky’s all-electric helicopter technology that is being developed – go to: http://tinyurl.com/66rq52z to see an image.

Now it is time for kids to start innovating – copy and hand out the “Future Flight Problem Identifier”. Have them try to think of problems that they could solve with a new and exciting design for the future. What would they want their helicopter to do?
2. What Will Your Helicopter 2050 Invention Look Like?
The next activity is designed to help kids put their thoughts and innovations into a design. Have them use
tenails and markers and paints to draw their helicopter. What will it look like from the top, from the side,
and from the bottom? If there are unique parts that they want to show – have them draw them separately.
Can they show in their drawing how it will work? What makes it unique and different from what they see now?
NOTE: We have provided a worksheet for this activity, but you may want to hand out large sheets of paper to
allow them more room to draw their ideas.

3. Refine The Design
This activity can be done in pairs. This uses the critical thinking process to get kids to look at their new design
and see if they could do something differently. Did they solve the problem that they set out to solve?

Extension: have them work together to build models of their design using paper, cardboard, clay, popsicle sticks
and other materials you have readily available in the museum.

4. SCAMMPERR (Substitute, Combine, Adapt, Minify, Magnify, Put to other uses, Eliminate, Reverse, Rearrange)
This activity will help kids change and improve their idea. Each category in SCAMMPERR tells them to perform
a different action and lets kids explore various options to enhance their design. After they go through all the
activities, they can decide if they want to keep any of the changes to enhance their innovation.

5. Give It A Name
Naming their “Helicopter of 2050” will be a lot of fun for innovators. This activity offers kids some organizing tips
about developing a name for their helicopter using different techniques.

When kids are ready to submit their idea(s) into the 5th Annual Sikorsky Helicopter 2050 Challenge,
they may easily enter online at www.Helicopter2050.com. Review the official rules on the program website.
Alternately, kids may use the official entry form found at the back of this binder. They will need their parent’s
permission (whether entering online or by mail). For mailed entries, kids should fill out the official entry form
and mail their submissions to:

Sikorsky Helicopter 2050 Challenge
c/o By Kids For Kids Co.
1177 High Ridge Rd.
Stamford, CT  06905

Good luck and happy innovating!
Future Flight: Problem Identifier

Helicopters can hover for extended periods of time and they can take off and land vertically. They have been used for rescuing people, to evacuate people from disasters, to report traffic, to transport people. What will the helicopter of 2050 do? What problems do you see in helicopters today that limit their abilities? Can you think of a solution? List (or draw) 4 problems and your idea for a solution.

<table>
<thead>
<tr>
<th>Problem #1:</th>
<th>Problem #2:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Solution:</td>
<td>Solution:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem #3:</th>
<th>Problem #4:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Solution:</td>
<td>Solution:</td>
</tr>
</tbody>
</table>
What Will Your New Helicopter Invention Look Like?

• Collect colored pencils, pens, or markers for drawing and a ruler/protractor

Are the blades in a different place? Is it shaped differently? Does it have something new or different on it that serves a special purpose? Where does the pilot sit? What is it made of? Is it really BIG or really small or maybe something in between? Remember the problems that you identified with the current helicopter design and your solutions – how do they figure into your design? Think about these questions, then use the space below to draw four different views of your invention: 1) from the top, 2) from the bottom, 3) from the left side, and 4) from the right side.
Refine the Design

Now that you have created your design for your helicopter of the future, use these questions to see if you can refine your design to make it better.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What problem does my new design help solve or address?</td>
<td></td>
</tr>
<tr>
<td>What else could I do to solve that problem?</td>
<td></td>
</tr>
<tr>
<td>What are the advantages of my helicopter?</td>
<td></td>
</tr>
<tr>
<td>If I wanted to build a model of my helicopter, how would I try to do it?</td>
<td></td>
</tr>
<tr>
<td>What materials will I need to make my model?</td>
<td></td>
</tr>
<tr>
<td>If I were to change one thing on my design, what would it be?</td>
<td></td>
</tr>
<tr>
<td>How could I change it to make it better?</td>
<td></td>
</tr>
</tbody>
</table>

Find a buddy and show them your design.

Do they think it will work?

Do they think you solved the problem you set out to solve?

Can they suggest any changes/refinements to your design?
## Using “SCAMMPERR” to Refine My Helicopter Invention

Fill in each box using the technique to change your invention and improve/make it better, make it more unusual or just plain play with your idea.

<table>
<thead>
<tr>
<th>My invention</th>
<th>What did you invent?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong>ubstitute: What else can it do? How can I change it to do that? What other material can I use?</td>
<td></td>
</tr>
<tr>
<td><strong>C</strong>ombine: How can I combine this with another object or purpose?</td>
<td></td>
</tr>
<tr>
<td><strong>A</strong>dapt: What else is like this? What could I copy and add to it? How can I change it?</td>
<td></td>
</tr>
<tr>
<td><strong>M</strong>inify: How can I make it smaller? Miniature? Reduce parts? Change order, shape, form?</td>
<td></td>
</tr>
<tr>
<td><strong>P</strong>ut to other uses: New ways to use the item? Other places to use it?</td>
<td></td>
</tr>
<tr>
<td><strong>E</strong>liminate: What to subtract? Condense?</td>
<td></td>
</tr>
<tr>
<td><strong>R</strong>everse: turn it backward? Upside down?</td>
<td></td>
</tr>
<tr>
<td><strong>R</strong>earrange: interchange components?</td>
<td></td>
</tr>
</tbody>
</table>

Now look over your changes and decide which one or which ones you will make to improve your idea. Write about that here:
Time To Give Your Helicopter Design A Name

There are lots of fun ways to find a name for your Helicopter 2050 design.

Think about what your helicopter does. What problem will it solve or address? Name it after yourself, or name it with initials. Read the naming ideas below, and then try it yourself!

1. Name it for what it does or what makes it different.
   **HINT:** Play with the words until you find a catchy way to put them together.

   Austin Meggitt named his invention "Battie Caddie". He invented a device to hold his baseball bat, glove and ball on his bicycle. A “Caddie” is used to carry something. He used the word “Battie” for his bat so that it would rhyme.

   Write what makes your helicopter design different here, something special that it does:
   __________________________________________________________

   Try naming your helicopter using what it does: ____________________________

2. Name it after yourself.
   Some famous examples: Ford (for Henry Ford), Braille (for Louis Braille), Levis (for Levi Strauss).

   Write your first and last name here:
   __________________________________________________________

   Use your name to name your helicopter here
   __________________________________________________________

   Write your initials here: __________________________________________

   Can you use your initials to make a name for your helicopter? ____________
3. Name it with letters and numbers. Helicopters and aircraft are often named with letters and numbers.

List your favorite numbers and some letters that mean something to you:

______________________________________________________________________

Try combining different numbers and letters to form a name for your helicopter.

Write that name here: ___________________________________

Practice saying some of the names you have created.

My favorite name for my environmental helicopter of the future is: ________________________________
ESSENTIAL SIKORSKY HELICOPTER 2050 CHALLENGE MUSEUM PROGRAM FORMS

This section contains all of the forms you will need for the program.

- **Sikorsky Helicopter 2050 Official Entry Form:**
  Copy this form, along with the permission form for participants between the ages of 9 and 16.

- **Competition Entry Parental Permission Form:**
  Parents MUST fill out this form in order for their child’s entry to be considered.

- **Official Competition Rules:**
  Also available on the [www.helicopter2050.com](http://www.helicopter2050.com) website, this form should be sent home with each entry form and permission form.

- **Press Release Template:**
  Use this form to drum up media interest in your use of this S.T.E.A.M. program/competition.
  Local newspapers often feature stories about innovative and exciting programs!

- **Parent Permission Media Release Form:**
  If you are going to alert the media, you need to collect these forms.

- **Certificate of Achievement Template:**
  Print out, fill in, and hand out to each participant. Recognizing their participation is an important way to encourage future innovators!

- **Name Tag Template:**
  Program facilitators and assistants should wear name tags to help kids know who they should ask for help.

- **Facilitator Feedback Form:**
  BKFK wants to know what you think, how the program went, and to learn how to improve the program for next year. Please consider taking time to help shape the 2016 program.
**OFFICIAL ENTRY FORM**

Kids ages 9 to 16 are challenged to come up with an idea for a sustainable and environmentally friendly helicopter of the future!

This entry form MUST be accompanied by the Parental Permission Form in order for a participant to enter the 5th Annual Sikorsky Helicopter 2050 Challenge.

Name: ___________________________ Date: __________________

5th ANNUAL HELICOPTER 2050 CHALLENGE ENTRY:

Participants must answer all of the questions below. If you need additional room, please attach a separate sheet of paper. Please include your name, age, address, home phone number, and email address (if you have one) on the back of any supporting materials (artwork, images, photos) that are included with the entry. You may choose to enter online at www.helicopter2050.com.

5th ANNUAL HELICOPTER 2050 CHALLENGE ENTRY:

1. First, name your helicopter! (This will be the title of your entry.)

2. Next, tell us about your helicopter idea and provide a detailed description.
   - What will your helicopter look like?
   - What will it do, or how will it be used?
   - How will it be fueled?

3. Now, let us know why and how your helicopter will be sustainable and environmentally friendly.

4. Explain the features your helicopter will include and how your helicopter is an improvement on existing helicopters.

5. Attach at least one drawing of your helicopter concept. You may attach up to 3 images.

6. Let us know: How did you learn about the competition?

All completed entries (with accompanying permission form and any supporting attachments) must be mailed to: Sikorsky Helicopter 2050 Challenge, c/o BKFK, 1177 High Ridge Rd., Stamford, CT 06905. All mail-in entries must be postmarked by October 15, 2015.
PARENTAL PERMISSION FORM

This form must be included with all entries. No entries will be accepted without parental approval on this form.

IMPORTANT:

Dear Parent/Guardian,

By giving consent, you represent that you are the parent/legal guardian of the named child, and on behalf of you and your minor child affirm, acknowledge and agree to the COMPLETE competition rules as set forth at www.helicopter2050.com

Name of Participating Organization (If applicable): ____________________________________

Entry Name: ____________________________________ Date:_________________________

Child’s Full Name: ____________________________________________________________

Date of Birth: _____/_____/_______       Gender: _____________

Parent/Guardian Name (Please Print):_______________________________________________

Parent/ Guardian Address: _______________________________________________________

City:___________________________________________ State:________ Zip:_____________

Telephone:________________________ Email ______________________________________

Parent /Guardian Signature:_________________________________Date:_____/_____/______

Abbreviated Rules: No purchase necessary. Entries submitted must be postmarked no later than 10/15/15. No materials will be returned. This competition is open to kids who are at least 9 years old and not older than 16 at the time an entry submission is submitted. Only individual entries are accepted. Void where prohibited. For full rules and details, visit www.helicopter2050.com
SIKORSKY HELICOPTER 2050 CHALLENGE
Official Rules

No Purchase Necessary to participate.

1. ELIGIBILITY AND OVERVIEW: The Sikorsky Helicopter 2050 Challenge (hereafter “Competition”) is offered only to individuals who are legal residents of the 50 United States and District of Columbia, and are at least 9 years of age and not older than 16 at time of entry. Employees, officers, directors, and advisors of The By Kids For Kids Company (“BKFK” or “Administrator” and Sikorsky Aircraft Corporation (“Sikorsky” or “Sponsor”) and their respective parents, affiliated and subsidiary companies, advertising and promotion agencies, Competition judges, web masters and web suppliers, and persons engaged in the development of the Competition & Competition materials and members of the immediate family (parents, siblings, children [natural, adopted, foster] and spouse, wherever they reside) and household members (whether or not related) of such employees, officers, directors, and advisors are not eligible. By participating, you agree (and if you are a minor in the jurisdiction in which you reside, [hereafter, a “minor”] your parent/legal guardian agrees) to these Official Rules and all the decisions of Administrator, which are final and binding in all respects. Void where prohibited.

The object of the Competition is to submit ideas and/or designs for a sustainable and environmentally friendly helicopter of 2050. Entries will be evaluated by a panel of qualified judges to determine one National Grand Prize (as more specifically described below) Winner and 4 Finalists.

COMPETITION PERIOD: Competition begins on 6/1/15 and ends on 10/15/15. All entries must be entered using the Official Entry Form online (beginning at noon on 6/1/15 and ending at midnight on 10/15/15, EST) or sent by mail to the Administrator, and must be postmarked no later than 10/15/15.

2. HOW TO PARTICIPATE: To participate in the Helicopter 2050 Challenge complete the online entry form found on the Competition website, www.helicopter2050.com, with all information requested and submit entry online or print an Official Entry Form from the Competition website, www.helicopter2050.com, or obtain an entry form from select museums, camps, and/or schools that are running the program. Print the entry form, complete the entry form with all information requested, and mail it, along with the completed parental consent form, to: Sikorsky Helicopter 2050 Challenge, c/o By Kids for Kids Co., 1177 High Ridge Rd., Stamford, CT 06905.

(NOTE: NO ENTRIES WILL BE ACCEPTED WITHOUT A PARENT/LEGAL GUARDIAN PERMISSION SIGNATURE)

3. THE COMPETITION ENTRY: Complete the Official Entry Form online or by mail including a description of your new, original helicopter design. Participants must attach at least one and no more than 3 supporting images or drawings with their entry. All entries must be in English. Only individual entries will be accepted; no group entries will be accepted. Each page of an entry that is submitted by mail must be legible, and the back of each page must include entrant’s signature, name, and complete contact information, including email address, daytime phone number, age, and the name of the entry. Entries must be: 1) typed or neatly hand printed; and 2) 10 pt. font or larger. The entrant listed on the entry form will be the only person eligible to receive a prize or prizes. An entrant may enter as often as he/she wishes as long as each idea is unique and includes all information requested. All entries must be sent in a separate addressed, stamped envelope, postmarked by 10/15/15 or entered online by 10/15/15 at midnight (EST). ALL ENTRIES MUST BE ACCOMPANIED BY SIGNED PARENTAL PERMISSION. The required Parental Permission is on the official entry form. Entries that do not contain the required information will not be accepted. Entrants must ensure, to the best of their knowl-
edge, that their entry is original and does not include any images, or written word(s) owned by a third party. Entry must be in keeping with Sponsor’s image and may not be offensive, as determined by Sponsor in its sole discretion, nor can it defame or invade publicity rights or privacy rights of any person, living or deceased, or otherwise infringe upon any person’s personal or proprietary rights. For purposes of this Competition, Sponsor is interested in entries which celebrate the potential of helicopter design and use. Once an entry is submitted, it is the entrant’s sole responsibility to maintain contact information for entrant and parent/legal guardian to be sure it is current. Neither Sponsor nor Administrator is responsible for any failure to contact entrant or entrant's parent/legal guardian if the contact information is not current. To update contact information, send request to info@bkfk.com, or by mail to: Sikorsky Helicopter 2050 Challenge, c/o By Kids for Kids Co., 1177 High Ridge Rd., Stamford, CT 06905.

Entries once submitted become the property of Administrator and will neither be acknowledged nor returned. By submitting an entry, entrant (and your parent/legal guardian if you are a minor) acknowledges that other entrants may submit the same or similar invention/idea or product and/or that BKFK may have received the same or similar invention/idea/product from a third party independent of this Competition. Entrant (and your parent/legal guardian if you are a minor) (1) agrees that neither BKFK nor any of the Competition Entities shall have any responsibility or liability for any such submissions in this Competition or from a third party, (2) waives any claims or damages of any kind or nature whatsoever, including but not limited to, direct, indirect, incidental, consequential or punitive damages, should BKFK pursue, in any manner any such submission in this Competition or from a third party.

4. JUDGING: Initial Judging: All eligible entries will be preliminarily judged to determine the top 15 submissions provided there are sufficient eligible entries, by administrator. All decisions are final on all matters relating to the judging of the Competition. The top 15 entries will be determined based on the following Preliminary Judging Criteria: Uniqueness of concept (50%); Description of helicopter (25%); and level of sustainability/environmental friendliness (25%). The top 15 selected entries will be re-judged by a team of qualified judges appointed by the Sponsor and Administrator, to determine 5 Finalists on or about November 15, 2015, based on the 5 highest cumulative scores for the Judging Criteria.

Finalist Judging: The Finalist with the highest cumulative score will be the 1 Grand Prize Winner. The Finalist Judging Panel will be appointed by the Sponsor and Administrator and will use the above listed Judging Criteria in scoring the Finalists’ entries. In the event of a tie in the Grand Prize round of judging, Sponsor will make the final determination of the Grand Prize Winner. In the event of a tie in any round (besides Grand Prize judging), tied entries will be re-judged based solely on uniqueness of concept.

5. PRIZES AND APPROXIMATE RETAIL VALUES: Grand Prize (1): One Grand prize winner will receive the “Igor Sikorsky Youth Innovator Award” in the form of a trophy, a $1000 Scholarship (this will be presented as a check), and a trip to Sikorsky headquarters in Stratford, CT for 2 days/1 night with one parent/guardian to attend the award presentation and tour the facility. Trip includes airfare, transfers, & hotel for 2 (approx value $1200). Runner-Up Prizes (4 - for those Finalists who do not win the Grand Prize): A Sikorsky “prize pack,” certificates of achievement, and celebration on the website.

6. PRIZE RESTRICTIONS: Prizes will be awarded provided a sufficient number of eligible entries are received. Winners will be notified by phone, mail or email. Prizes are not transferable; no substitutions or cash equivalents are allowed except by the Sponsor who reserves the right to award a prize of equal or greater value if advertised prize is unavailable.
7. GENERAL RULES: By participating, entrants and their parents/legal guardians agree to the Official Rules and the decisions of the Judges and Sponsor, which shall be final and binding in all respects. Winners/Finalists will be notified by phone, mail or email. Entry materials become the sole property of the Administrator and will not be acknowledged or returned. Winners/ Finalists (and their parent/legal guardian, if they are a minor) acknowledge and agree that their entry materials may be reproduced, promoted and publicized by Sponsor in any way Sponsor sees fit. Winners/Finalists and their parents/legal guardians hereby grant Sponsor and Administrator, its parent, affiliates, subsidiaries, assigns, licensees, and legal representatives the irrevocable, perpetual, worldwide right to distribute, have distributed, publicly and privately display, communicate, transmit, have transmitted, and promote the entry materials (as such may be edited and modified by the Sponsor in its discretion) for editorial, commercial, promotional and all other purposes. Ownership of the entry shall remain with the entrant unless otherwise agreed in writing with Sponsor. Acceptance of any prize constitutes permission of such Winner (and his or her parent/legal guardian) to use Winner’s name, likeness, hometown, and Winner’s photograph, voice, video statements and entry submissions or a brief description of Winner’s entry submissions, without further compensation, except where prohibited by law in all media, known or hereafter discovered, worldwide and on the World Wide Web and Internet, at any time (or times), for advertising, trade, commercial and promotional purposes, without notice, review or approval. Finalists and their parents/legal guardians will be required to execute and return an Affidavit of Eligibility, and a Liability/Publicity Release within 7 days of notification attempt or the prize will be forfeited and an alternate Finalist selected, based on the Judging Criteria set forth above. Affidavit packages will be mailed via overnight mail with a prepaid overnight return envelope included. Return of any prize, prize notification as undeliverable may result in disqualification and selection of an alternate Winner. Taxes, if any, related to the prize are the sole responsibility of the individual Winner. No responsibility or liability is assumed for damages, losses or injury resulting from acceptance or use of any prize. The Sponsor and its agents, and Administrator are not responsible for deliveries or any failure to deliver by any courier or postal service, technical, hardware, software or telephone or facsimile malfunctions of any kind, lost or unavailable network connections, or failed, incorrect, incomplete, inaccurate, garbled or delayed electronic communications caused by the user or by any of the equipment or programming associated with or utilized in this Competition or by any human error which may occur in the processing of the entries in this Competition. No responsibility is assumed for lost, misdirected, illegible, damaged, postage due or late mailed entries. The Sponsor reserves the right, in its sole discretion, to disqualify any individual that tampers or attempts to tamper with the entry process; violates the Official Rules; or acts in an unsportsmanlike or disruptive manner, or with intent to annoy, abuse, threaten or harass any other person. Any attempt by any person to deliberately undermine the legitimate operation of the Competition may be a violation of criminal and civil law, and, should such an attempt be made, Sponsor reserves the right to seek damages from any such person to the fullest extent permitted by law. Sponsor’s failure to enforce any term of these Official Rules shall not constitute a waiver of that provision. The Sponsor and each of its parent, affiliates, officers, directors, agents, and employees, and Administrator shall have no liability or responsibility for any claim arising in connection with participation in this Competition or any prize awarded. Winners and entrants assume all liability for any injury or damage caused, or claimed to be caused, by participation in this Competition or use or redemption of any prize.

8. GOVERNING LAW & VENUE: The State of Connecticut courts (state and federal) shall have sole jurisdiction of any controversies regarding the promotion and the laws of Connecticut shall govern the same. Each entrant and his or her parent or legal guardian waive any and all objections to jurisdiction and hereby irrevocably submit to the venue of those courts within Connecticut.

10. SPONSOR: The Sponsor of the Competition is Sikorsky Aircraft Corporation, 6900 Main Street, Stratford, CT 06614.

11. ADMINISTRATOR: The Administrator of the Competition is By Kids For Kids Company, 1177 High Ridge Road, Stamford, CT 06905.
YOUR ORGANIZATION NAME HOSTS THE 5TH ANNUAL SIKORSKY HELICOPTER CHALLENGE

THE SIKORSKY HELICOPTER 2050 CHALLENGE PROVIDES INTERACTIVE “INVENTING FLIGHT” EXPERIENCE FOR LOCAL YOUTH

CITY, State, Date - Did you know that Igor Sikorsky dreamed of the helicopter when he was a teenager? Or that the TV was invented by a kid, Philo Farnsworth, at the age of 14? Or that Louis Braille was only 12 when he invented the Braille reading system, or that Blaise Pascal invented the calculator at age 18?

(YOUR ORGANIZATION NAME) is pleased to announce that they have partnered with the Connecticut-based By Kids For Kids Co. (BKFK) and Sikorsky to bring the exciting 2015 5th Annual Sikorsky Helicopter 2050 Challenge to the museum.

The Sikorsky Helicopter 2050 Challenge provides an extraordinary opportunity for kids to take a real shot at innovation, featuring a fun, fast-paced series of hands-on building sessions that start with a few ideas and end with a concept for a helicopter of the future. This experiential process teaches kids to think fast, creatively solve problems and execute ideas with varying amounts of guidance. “We are very excited to work with [your organization name] in reaching the community with an alternative activity for kids. We invite all kids to explore their ideas in this fun program,” says Norm Goldstein, CEO of By Kids For Kids Co. Projects range from building rubber band helicopters to testing controlled flight. Every participant will be given the tools to maximize their creative potential.

Register for the 5th Annual Sikorsky Helicopter 2050 Challenge at (YOUR ORGANIZATION NAME) by calling (xxx) xxx-xxxx, or on the web at: ---------------

About By Kids For Kids Co:

By Kids For Kids (BKFK), a closely-held corporation based in Stamford, CT, is a groundbreaking venture entirely dedicated to inspiring and stimulating the innovative spirit within all young people. BKFK has created a platform to foster, share, showcase, and commercialize youth innovation and entrepreneurship. Representing some of the most brilliant young minds in America, BKFK rewards kids for innovation excellence and encourages young people to pursue problem-solving thinking in their education and careers.

For more information about BKFK, please contact media@bkfk.com or call Judy Klym at (203) 921-9039. Also please visit our website, http://www.bkfk.com. For more information about (YOUR ORGANIZATION NAME), please contact: -------- ---------- at (xxx) xxx-xxxx.

###
PARENT PERMISSION FORM

I am the parent or legal guardian of _________________________ (my “Child”). BKFK and/or _________________________ (name of participating organization) has my permission and consent, and I hereby grant BKFK a license to use and publish my Child’s photograph and video taken at _________________________ and profile information in print, online and in any other media now known or hereafter developed, and otherwise as necessary in connection with any such use and publication worldwide. Such information may include, for example, my Child’s First Name, Last Name, Age, Home City and State, provided that my Child’s full home address, phone number and personal email address are not published. Publications in which my Child’s photograph and information may be used and published include the BKFK web site, marketing materials and other publications.

Parent/Guardian’s Signature  ________________________________ Date  ________________________________

Please print name  ________________________________ Relationship  ________________________________

Parent/Guardian’s Signature  ________________________________ Date  ________________________________

Please print name  ________________________________ Relationship  ________________________________
Certificate of Achievement
FACILITATOR FOLLOW-UP FORM

1. A) What did your facilitators like best about the 5th Annual Sikorsky Helicopter 2050 Challenge?
   B) What did your visitors like best about the Sikorsky Helicopter 2050 Challenge?

2. A) What did your facilitators like least about the Sikorsky Helicopter 2050 Challenge?
   B) What did your visitors like least about the Sikorsky Helicopter 2050 Challenge?

3. What activity(s) will you repeat, and why?

4. What activity(s) are you less likely to repeat, and why?

5. Did you have enough time to complete each activity? □ yes □ no

6. Were age groupings appropriate to participant skill level? □ yes □ no
   If no, please explain.

7. What was the average group size?

8. Your recommendations/comments: