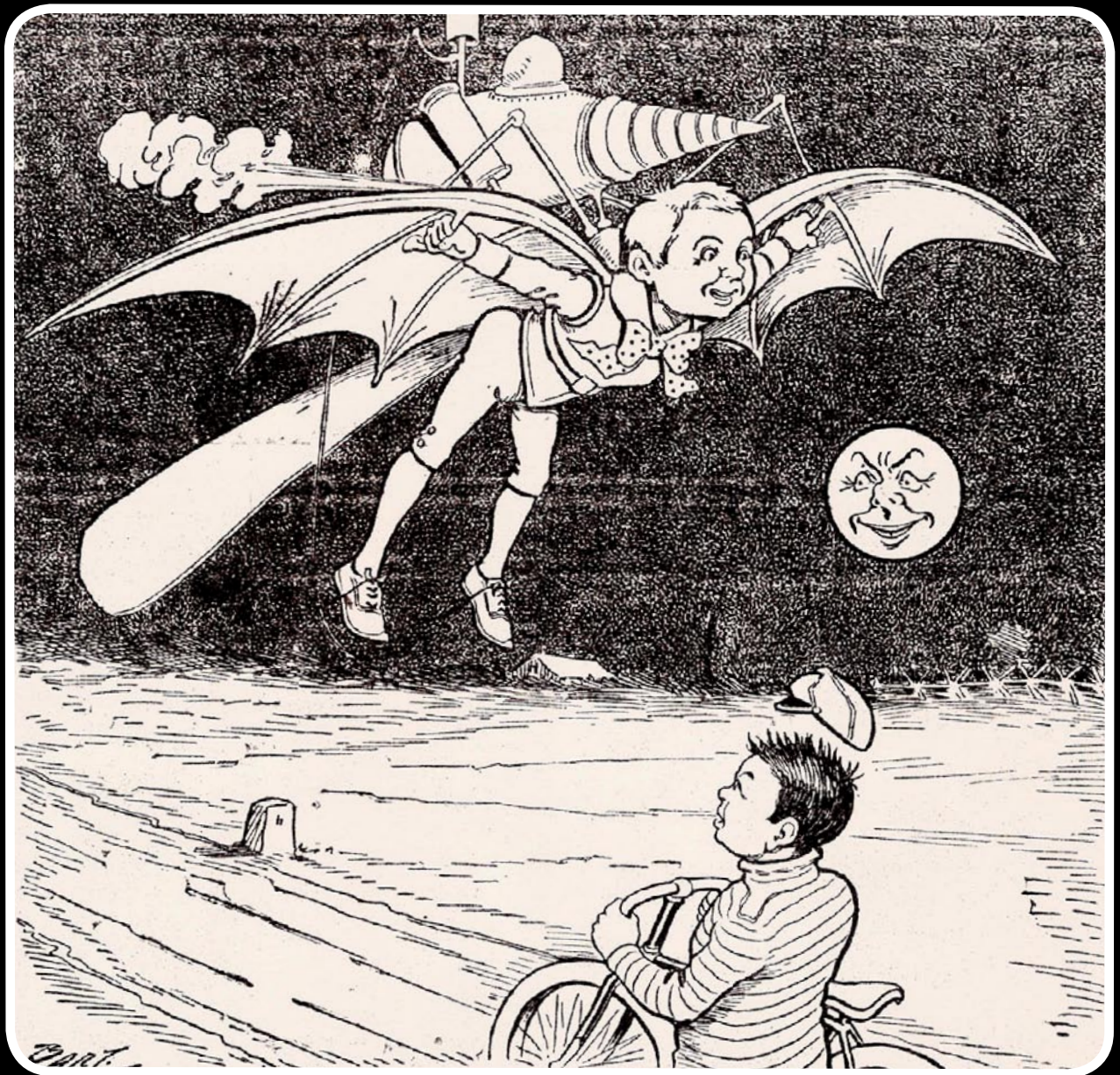
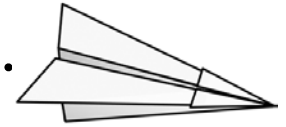


the Principles of Flight



Teacher's Package

Introduction



Welcome to our Principles of Flight teaching package! As you are aware, this year sees the debut of new science curricula for grades six to nine. The Saskatchewan Science Centre has planned a number of initiatives to assist educators as they integrate this innovative content into their classrooms. We are principally excited to be showcasing during the year workshops that address each topic new to your science class. See our website or your copy of *Beyond the Classroom* for more details.

Grade six's **Principles of Flight** (FL) is receiving even more attention. In addition to the 90-minute workshop we are offering from November to March, we have with this document compiled valuable print and online resources to assist with your unit development and delivery. From the history of human flight to forces in flight to student design exercises, the content we've selected includes video, software, printable resources, and more. We've even included a sample table on which students can record data collected from their prototypes.

In the hopes of motivating educators and students alike, we will also be hosting a **Grade Six Aeronautics Challenge** on March 21, 2010. On this day, we invite representative students from around the province to not only fly their prototypes and share what they have learned, but also enjoy the Powerhouse of Discovery and attend an exclusive IMAX screening of *The Magic of Flight*. (All for free, of course!) This year's specifications will focus on a paper airplane designed for indoor distance, but expect different challenges in the year ahead. See below for more details and suggestions on how to host a preliminary qualifying challenge at your own school. Complete, copy, and post the last page of this document to advertise the challenge to students and fellow teachers.

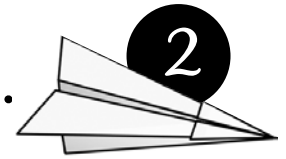
Please feel free to email me if you have any questions about the challenge, our workshops, topics new to the curricula, or suggestions for next year's challenge.

Keep looking up,

Chad Reiss
Education Programs Coordinator
Saskatchewan Science Centre
creiss@sasksciencecentre.com

Tips & Hints

2



For Teachers

- Use the tables included in this package and encourage students to create their own to pursue independent analysis
- With your students, investigate thrust, drag, lift, and gravity
- Jobs to rotate during group work include folder, timekeeper, retriever, recorder, and thrower
- This topic is ripe for combining Required Areas of Study
 - use tangible, detailed information from test flights for the data management strand of the mathematics curriculum
 - design, decorate, and study planes aesthetically as part of visual arts
 - practice and experiment with what makes good throwing form during physical education
 - plan, describe, analyze, or write proposals for funding to develop language arts skills
- Use the challenge as a skeleton for teaching “FL6.3: Design a working prototype of a flying object that meets specified performance criteria”
- Don’t initially confine your students to the rules of the challenge
- Discuss directional, spiral, and pitch stability
- Write Chad at creiss@sasksciencecentre.com if you have questions

For Students

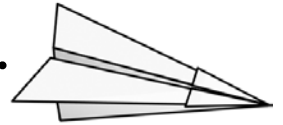
- Trying new designs is cheap, so make lots of planes
- Practice inside—gymnasiums are perfect
- Don’t be tied to any one design or shape
- Make small changes and record what happens
- Research, prototype, and then evaluate
- Name or number your planes so you can properly keep track of them
- Fine tune elevators and rudders
- Separate relevant characteristics from unimportant characteristics

For Contest Organizers

- Emphasize fun first, process second, and standings last
- To encourage younger students to participate in later years, open your own competition to all grades
- Provide full rules as early as possible; clarify where necessary
- Be fair and consistent
- Use the same construction requirements as the provincial challenge
- Print paper with school mottos or team symbols to create planes on mass for use at rallies, assemblies, and games
- Don’t disappoint designers who misunderstood a rule; let them fly their planes, and make it clear they will be ineligible for prizes or standings
- Print, copy, and distribute the advertising poster included in this package

Flight Record

Name _____

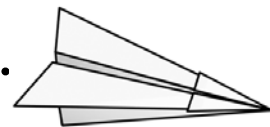


Use this table to keep a record of data from your flights. A flight's average speed can be calculated by dividing distance by time. If you need more than one copy of this table, be sure to number each one.

Flight Number	Plane Name	Distance Flown	Time in Air	Average Speed (d/t)		
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Observations

Name _____



Summaries by Plane

Use this table to summarize flight data for each of your planes.

Special characteristics might include wingspan, plane length, elevators, ailerons, or rudders.

Plane Name	Average Distance	Special Characteristics

Observations by Characteristic

Use this table to evaluate characteristics that might affect flight distance.

Observations might include turning, diving, climbing, or spinning.

Characteristic	Observations of Flight



The Rules

5



Grade Six Aeronautics Challenge Rules

1. Maximum of two teams per school.
2. Teams may consist of one or two students.
3. At least one student on each team must be enrolled in the sixth grade for the 2009/2010 school year.
4. Notification of intention to participate must be received by the Saskatchewan Science Centre by no later than March 17, 2010.
5. Each participant and one adult per school will receive free admission to the Saskatchewan Science Centre exhibit floor.
6. Construction materials may include no more than:
 - a. one sheet of white paper, measuring no more than 216 mm x 279 mm (8.5" x 11")
 - b. one or two pieces of transparent tape, measuring in total no more than 25 mm (1")
7. The sheet of paper may be folded and/or cut to produce a flying object.
8. All construction will take place at the Saskatchewan Science Centre using materials provided by the Saskatchewan Science Centre.
9. Three trials per team are allowed; the best attempt will be recorded.
10. All trials will be conducted in a hall approximately 8' high, 14' wide, and 80' long. Trial distance will be measured to first point of contact with floor, ceiling, or wall.
11. In the event that more than one plane travels the full distance of the hall, scoring balance will shift to height upon striking the wall.
12. In addition to total distance traveled, points will be awarded for methodology and presentation.
13. Participants are strongly encouraged to summarize their research, development, and testing on a presentation board or in a notebook, with special attention given to quantitative analysis.
14. Any additions, deletions, or changes to these contest rules will be provided on the Saskatchewan Science Centre website before March 1, 2010.

Online Resources

6



Links for Teachers and Students

History

http://www.nasm.si.edu/wrightbrothers/index_full.cfm

<http://invention.psychology.msstate.edu/>

http://en.wikipedia.org/wiki/Paper_plane

Lessons

<http://illuminations.nctm.org/LessonDetail.aspx?ID=L296>

<http://www.allstar.fiu.edu/aero/princ1.htm>

<http://wings.avkids.com/Book/beginner.html>

<http://www.grc.nasa.gov/WWW/K-12/airplane/airplane.html>

<http://ksnn.larc.nasa.gov/pokemon/unseen/>

http://www.tryscience.org/experiments/experiments_nosedive_athome.html

http://www.boeing.com/companyoffices/aboutus/community/fof_resources.html

Online activities

<http://www.pbs.org/wgbh/nova/xplanes/>

Design

http://www.dmoz.org/Arts/Crafts/Paper/Origami/Paper_Airplanes/

<http://www.paperplanedb.org/>

<http://www.origami-kids.com/>

<http://origamitube.com/>

<http://www.paperaircraft.com/>

<http://www.paperplane.org/>

Video

http://casmuseum.org/video_gallery.shtml

http://www.lerc.nasa.gov/WWW/Wright/podcast/Podcast_newton.m4v

Free software

http://www.grc.nasa.gov/WWW/K-12/freesoftware_page.htm

Printable lessons (including more links)

<http://www.awal.ca/files/BigPictureN/23N-InterPaperAirplane.pdf>

http://www.beaconlearningcenter.com/documents/2481_01.pdf

<http://www.middleschoolscience.com/paperairplane.pdf>



Books for Teachers and Students

Blackburn, K. & Lammers, J. (1994). *The world record paper airplane book*. New York: Workman.

Bosak, S. V., Bosak D. A., & Puppa, B.A. (1992) *Science is . . .* New York: Firefly Books.

Churchill, E. R. (1994) *Paper action toys*. New York: Sterling.

Collins, J. M. (1989). *The gliding flight*. Berkeley: Ten Speed Press.

Mander, Jerry. (1967). *The great international paper airplane book*. New York: Fireside.

Mathews, E. H. (1987). *Paper pilot*. Johannesburg: Struik.

Morris, Campbell. (1990). *Skybusters*. New York: Scholastic.

Ninomiya, Yasuaki. (1980). *Whitewings: excellent paper airplanes*. Tokyo: AGCO Ltd.

Razzi, Jim. (1990). *Paper airplanes to make and fly*. New York: Scholastic.

Stillinger, D. (2004). *Klutz book of paper aircraft*. Palo Alto: Klutz.

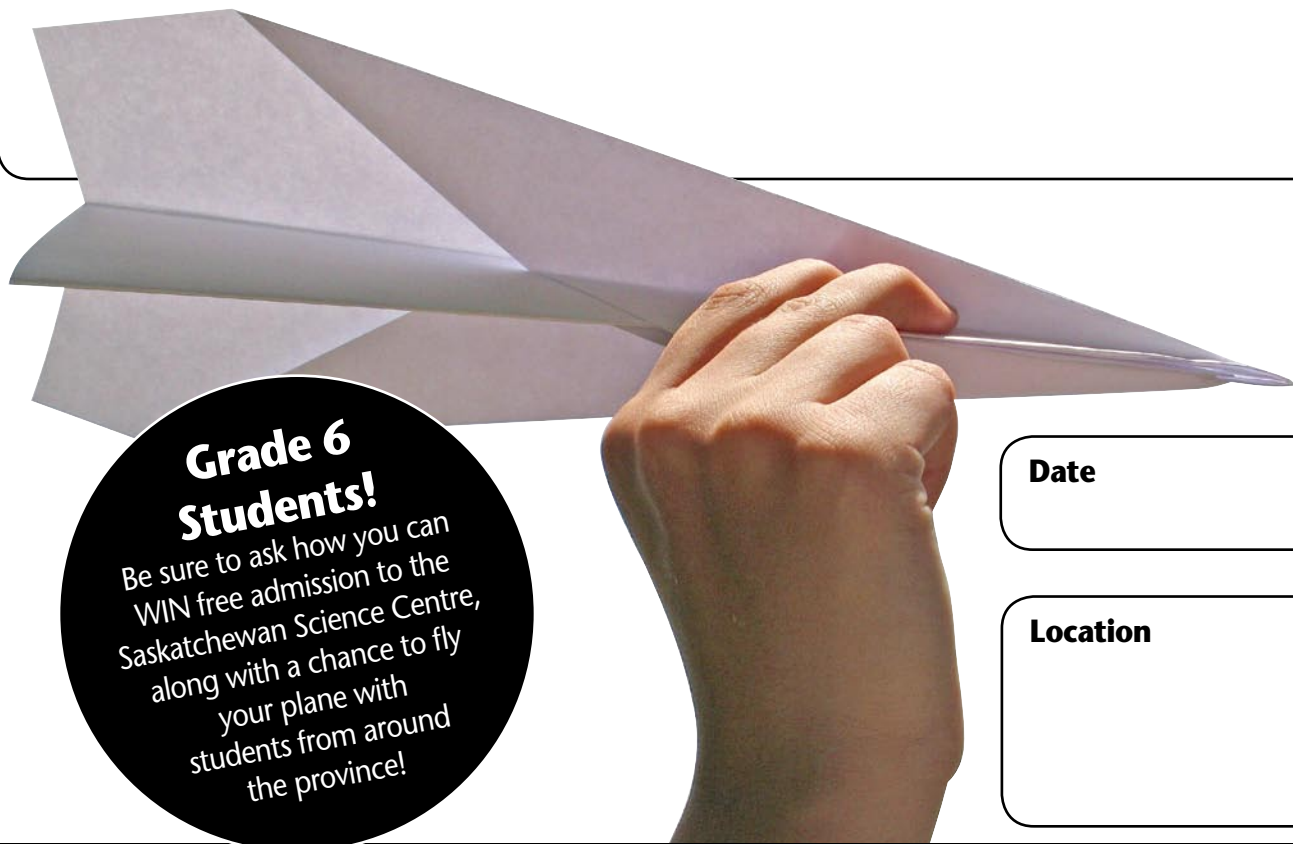
Paper Airplane Challenge

How far can you throw a paper airplane?

Find out by designing and flying your own plane with other students from your school!

Tips, Hints & Rules

1. Use only one piece of regular paper (but not this poster!)
2. Cutting is allowed.
3. Staples, paperclips, and hamster pilots are not allowed.
4. Work with a friend or by yourself.



Grade 6 Students!

Be sure to ask how you can WIN free admission to the Saskatchewan Science Centre, along with a chance to fly your plane with students from around the province!

Date

Location

For more information contact



SASKATCHEWAN
SCIENCE CENTRE