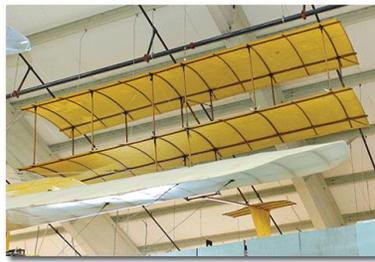




SOAR for Science



Airplanes, Forces, and Motion Educator Guide 2018-2019SY

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SOAR for Science: Airplanes, Forces & Motion Grades 3-5 Program Outline

Dear Educator,

Thank you for participating in the **SOAR for Science: Airplanes, Forces, and Motion** program! Please review this Educator Guide and distribute copies to all school staff participating in your SOAR for Science visit.

The SOAR for Science program is comprised of three phases:

Phase I: Your Classroom Pre-Visit

- Confirm your field trip date with me and book your buses with your district's transportation coordinator. Please mention your visit is part of the New England Air Museum SOAR for Science grant program when booking your bus.
- Distribute copies of the **Student Notebook** to all participating students. This document is available for download through the **Digital Resources Portal***.
- Guide students through the **Pre-Visit Lesson**. Students will complete the "K" and "W" sections of a KWL chart in their Student Notebooks and generate **Class Questions**.
- Administer the **Pre-Visit Assessment**.
- **Please bring Student Notebooks, Pre-Visit Assessments, and Class Questions with you on the day of your field trip.**

Phase II: The New England Air Museum Field Trip

- Students will participate in a series of hands-on activities, guided explorations and focused investigations as they learn about Forces and Motion via the four forces of flight. Students will also learn about our region's role in aviation history, both past and present. Please see your Confirmation Letter for arrival time and schedule.

Phase III: Your Classroom Post-Visit

- Guide students through the **Post-Visit Lesson**. Students will complete the "L" section of the KWL chart in their **Student Notebooks** and discuss answers to their **Class Questions**. If questions are still unanswered, please email them to me.
- Administer the **Post-Visit Assessment**.
- **Please mail completed Post-Visit Assessments in the self-addressed stamped envelope you received on the day of your field trip.**
- Complete the SOAR for Science Educator Survey. This survey will be emailed to you after your visit.
- Instruct your transportation coordinator to invoice your district for your bus fees. We will reimburse your district directly.

*You may access the **Digital Resources Portal** using the user name and password found in your **Introductory Letter** here: <http://neam.org/ed-soar-for-science.php>. If you have any questions, please don't hesitate to contact me. Otherwise, we look forward to hosting you and your students at the museum!

Sincerely,

Amanda Goodheart Parks, Ph.D.

Director of Education, New England Air Museum

(860) 623-3305 x313 agparks@neam.org

SOAR for Science: Airplanes, Forces & Motion Grades 3-5 Curriculum Alignments

Next Generation Science Standards

- **3-PS2-1 Motion and Stability: Forces and Interactions:** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- **4-PS3-1 Energy:** Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- **5-PS2-1 Motion and Stability: Forces and Interactions:** Support an argument that the gravitational force exerted by Earth on objects is directed down.
- **3-5-ETS1-3 Engineering Design:** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Common Core Standards

- **CCSS.ELA-Literacy.W.3.8-5.8:** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
- **CCSS.ELA-Literacy.SL.3.1.b-d,4.1.b-d, 5.1.b-d:** Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- **CCSS.ELA-Literacy.L.3.4-5.4:** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade level reading and content, choosing flexibly from a range of strategies.

Connecticut Social Studies Frameworks

- **Grade 3 Theme:** The Impact of Science, Technology, and Innovation on the Development of Connecticut: How have science, technology, and innovation affected the development of towns and cities in Connecticut (aerospace, insurance, manufacturing, etc.)?
- **Grade 4 Theme:** Defining Regions: Discover patterns related to various themes to define a region and define factors that make a region unique.
- **Grade 5 Theme:** The Role of Connecticut in U.S. History: Evaluate the political, economic, and social impact of key Connecticut industries on the state and national economies.

Massachusetts Science, Technology, and Engineering Standards:

- **3-PS2-1:** Provide evidence to explain the effect of multiple forces, including friction, on an object. Include balanced forces that do not change the motion of the object and unbalanced forces that do change the motion of the object.
- **4.3-5-ETS1-3:** Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a prototype
- **5-PS2-1:** Support an argument with evidence that the gravitational force exerted by Earth on objects is directed toward Earth's center.

Massachusetts English Language Arts and Literacy Standards:

- **3-5-SL-4:** Report on a topic, text, or solution to a mathematical problem, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace and using appropriate vocabulary.

Massachusetts Social Studies Standards:

- **3-5-SL-Content Areas:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on history/social science topics, building on others' ideas and expressing their own clearly.

SOAR for Science: Airplanes, Forces & Motion Grade 3-5

Pre-Visit Lesson

Materials:

- One copy of the SOAR for Science Student Notebook for each student
- One copy of the SOAR for Science Pre-Visit Assessment for each student
- Whiteboard, SMART board, or chalkboard
- Pens or pencils

Procedure:

- Distribute copies of the Student Notebook to all students and instruct students to write their names on their Notebook. This will be their notebook for the entire SOAR for Science program and will track their learning over the course of the program.
- Introduce the **KWL Chart on Page 2** of the Student Notebook. Explain that KWL Charts allow us to chart what we know, what we want to know, and what we have learned. Inform students that they will complete the "K" and "W" boxes before their museum visit, while the "L" box will be completed after their visit.
- Instruct students to think about balanced and unbalanced forces of flight. Instruct students to write three things they know about forces in the first box of their KWL chart, working individually. Review answers as a class and write some of their ideas on the board.
- Instruct students to write three things they want to know about balanced and unbalanced forces of flight in the second box of their KWL chart, working individually. Review answers as a class and write some of their ideas on the board.
- As a class, pick three things the students want to know about balanced and unbalanced forces of flight and turn them into three questions to investigate further during your museum visit. Instruct students to turn to **Page 3** of the Student Notebook and write these questions in the appropriate boxes of the **My Class's Questions** page.
- **Collect Student Notebooks at the end of the lesson. Please bring Notebooks with you during your museum visit!**

Assessment:

- Distribute copies of the **Pre-Visit Assessment** to students and instruct students to answer the questions as best they can. Explain that this is not a graded test for school. The assessment is meant to measure their learning after their museum visit. Students may have difficulty answering some or all of the questions; that is ok! Encourage them to do their best.
- **Collect Pre-Visit Assessments and bring them with you to the museum during your visit!** These assessments are critical to securing funding for future SOAR for Science visits.

SOAR for Science: Airplanes, Forces & Motion Grade 3-5

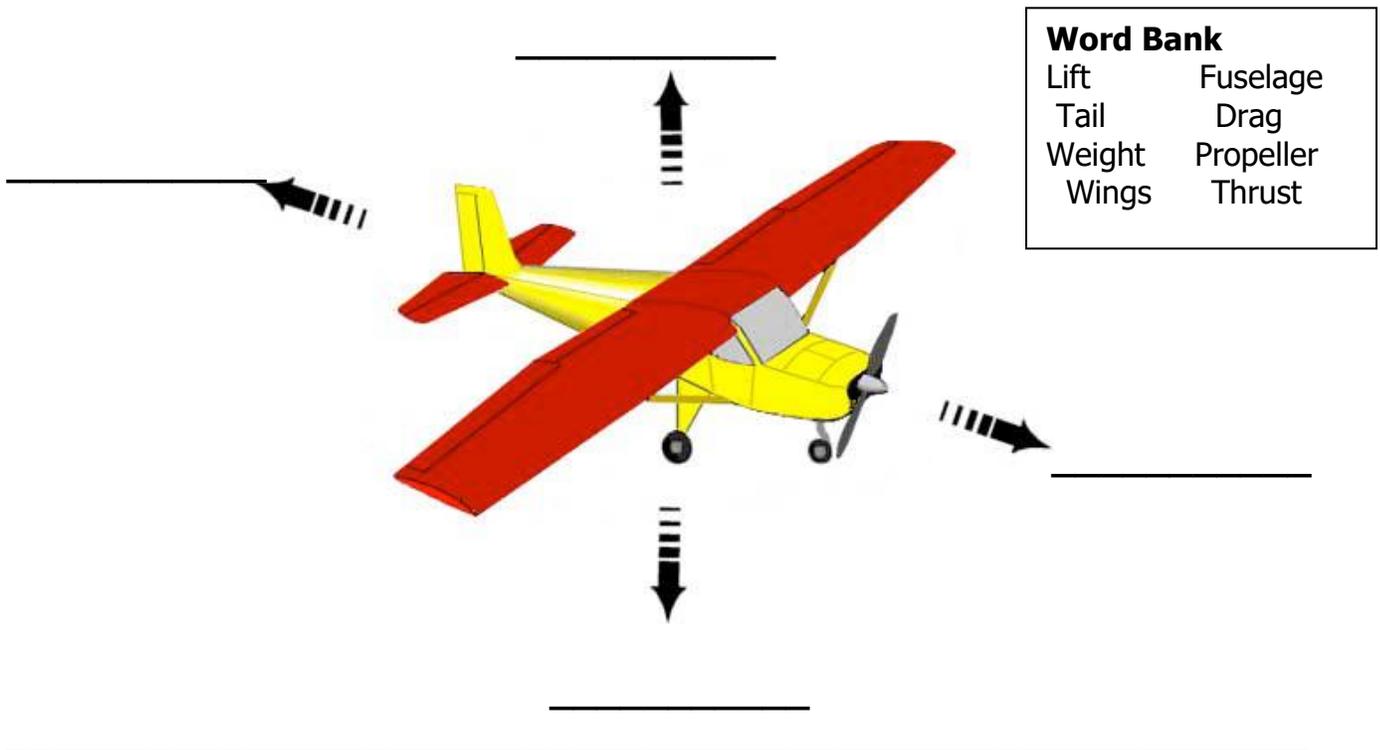
Pre-Visit Assessment

First Name: _____

Date: _____

School: _____

Label the four forces of flight that act on an airplane on the diagram using the word bank.



1. Weight (the measurement of gravity) is an example of what type of force? **Push** or **Pull**
2. Lift is an example of what type of force? **Push** or **Pull**
3. Drag is an example of what type of force? **Push** or **Pull**
4. Thrust is an example of what type of force? **Push** or **Pull**
5. An airplane's wings create what force? _____
6. An airplane's jet engine or propeller creates what force? _____

SOAR for Science: Airplanes, Forces & Motion

Grade 3-5 Post-Visit Lesson

Materials:

SOAR for Science Student Notebooks
One copy of the SOAR for Science Post
Whiteboard, SMART board or chalkboard
Pens or pencils

Procedure:

- Distribute Student Notebooks to students and turn to **KWL Chart** on **Page 2**.
- Instruct students to think about their museum visit, brainstorming as a class. What did they learn about airplanes from their experience? Instruct students to write their answers in the "L" box.
- Instruct students to turn to the **My Class's Questions** on **Page 3**. Review the three questions they brought to the museum. Were they able to discover the answers? If so, brainstorm answers together as a class and have students write the answers in the appropriate boxes. If not, email the questions to Amanda Goodheart Parks, Ph.D., Director of Education at agparks@neam.org and you will receive an answer within 7 business days.
- Students may keep their Notebooks to remember their visit to the New England Air Museum.

Assessment:

- Distribute copies of the **Post-Visit Assessment** to students and instruct students to answer the questions as best they can. Explain that this is not a graded test for school. The assessment is meant to measure their learning after their museum visit.
- **Collect Pre-Visit Assessments and mail them in the self-addressed stamped envelope you received on the day of your field trip.** These assessments are critical to securing funding for future SOAR for Science visits.



SOAR for Science: Airplanes, Forces & Motion Grade 3-5

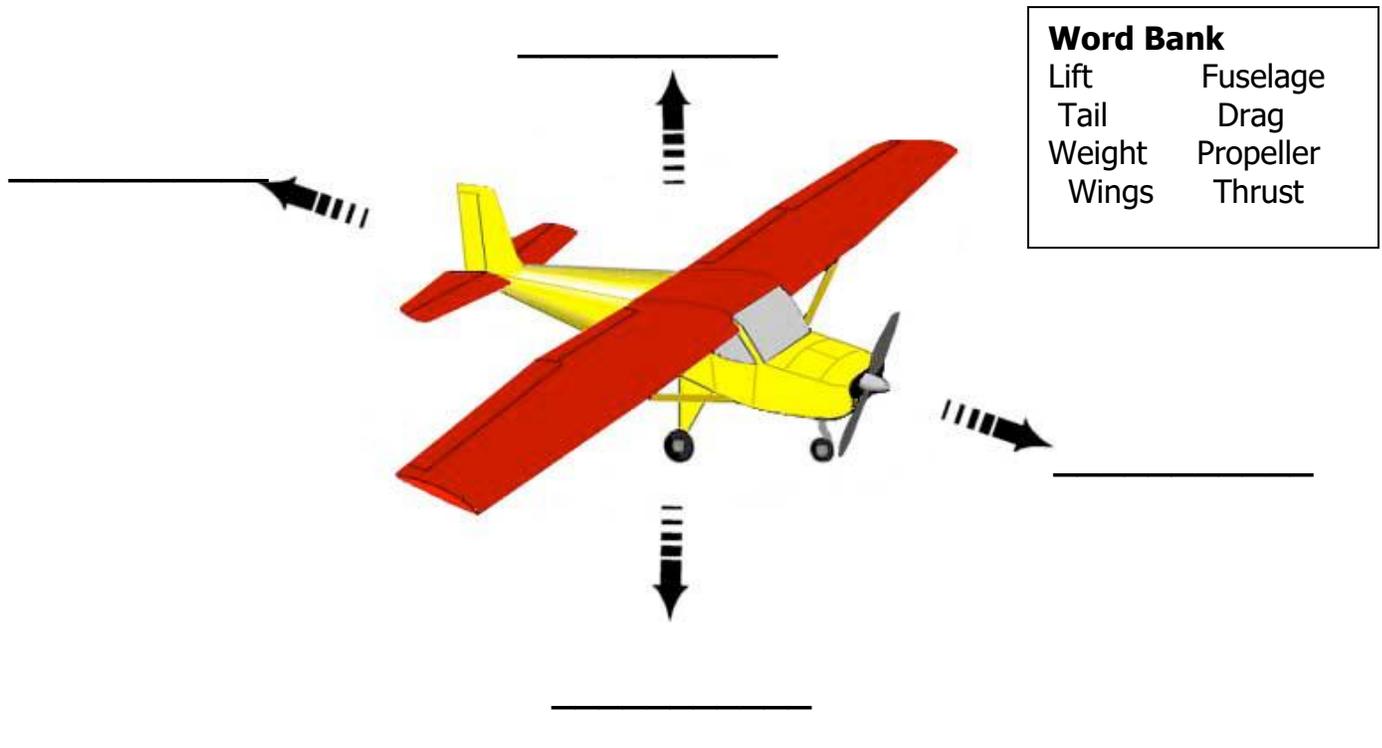
Post-Visit Assessment

First Name: _____

Date: _____

School: _____

Label the four forces of flight that act on an airplane on the diagram using the word bank.



1. Weight (the measurement of gravity) is an example of what type of force? **Push** or **Pull**
2. Lift is an example of what type of force? **Push** or **Pull**
3. Drag is an example of what type of force? **Push** or **Pull**
4. Thrust is an example of what type of force? **Push** or **Pull**
5. An airplane's wings create what force? _____
6. An airplane's jet engine or propeller creates what force? _____

SOAR for Science: Airplanes, Forces, and Motion Grade 3-5 Digital Resources Portal



As part of your SOAR for Science experience, you are encouraged to access the **SOAR for Science Digital Resources Portal** for additional resources on a variety of topics including:

Classroom Activities & Demonstrations

Primary Source Multimedia

Aviation & Aerospace Reference Materials

Professional Development Opportunities for Educators

Youth Aviation & Aerospace Organizations

...and much more!

To access the **SOAR for Science Digital Resources Portal**:

1. Visit our website at www.neam.org.
2. Click the Learn tab
3. Click SOAR for Science
4. Enter the user name and password provided to you by NEAM Staff.

Questions? Need assistance accessing the portal?

Contact Amanda Goodheart Parks, Ph.D.

Director of Education

agparks@neam.org (860) 623-3305 x313