**Lesson 2: What is FOD? Find Your FOD**

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| **Lesson** | **Title & Short Description:** | **Learning Outcome:** |
| #2 | Define the vocabulary - F.O.D.  Find Your FOD: Students will be shown a PPT with items that may (or may not) be FOD. They will be asked to analyze the pictures. | Students will use a Mentimeter or other poll option (like Forms) to determine if the pictures are FOD or not.  Students will discuss what damage the FOD could cause. |

**Problem statement: How can we improve our production process so that we have less debris (foreign object debris or FOD) left on the airplane during the build stage and can deliver a clean, safe airplane? What turns an object into FOD?**

***What changes to the process could be made that would eliminate FOD in other applications?***

**Learning objectives:**I can learn about the problem being presented and my role as a mechanical engineer trying to solve the airline’s problem. I will brainstorm ideas using my own background knowledge about planes and collaborate with classmates as to what could be causing the noise in the plane.

**Standards:** Next Generation Science Standards (NGSS), Common Core Standards (CCSS)

**Next Generation Science Standards:**

**5-PS1-3:** Make observations and measurements to identify materials based on their properties.

**3-5-ETS1-1:**

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

**3-5-ETS1-2:**

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

**3-5-ETS1-3:**

Plan and carry out fair tests in which variables our controlled and failure points are considered to identify aspects of a model or prototype that can be improved

**Common Core Standards:**

CCSS**.**[ELA-LITERACY.SL.5.1](http://www.corestandards.org/ELA-Literacy/SL/5/1/)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.5.1.A](http://www.corestandards.org/ELA-Literacy/SL/5/1/a/)

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.A](http://www.corestandards.org/ELA-Literacy/SL/5/1/a/)

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.C](http://www.corestandards.org/ELA-Literacy/SL/5/1/c/)

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

[CCSS.ELA-LITERACY.SL.5.1.C](http://www.corestandards.org/ELA-Literacy/SL/5/1/c/)

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

**Soft Skills:**

Listening, Critical Thinking, Collaboration, Communication (written and oral), Creativity & Innovation

**Materials:** (Teacher)Unit PowerPoint, Microsoft Forms or Mentimeter survey;

(Students) - paper or science journal and a pencil

**Lesson preparation:** 20 minutes to prepare your MS Form poll or Mentimeter survey

**Time required:** 20-30minutes to present each picture and discuss students’ replies. (Note: If you have the students come up with their own list at the end, it will take a bit longer.)

**Grouping of students for instruction:** whole class

**What is the instruction? Consider the PBL procedure that is being addressed here:** Students are working on understanding the problem by learning the essential vocabulary. Students are also still in the ‘exploring’ stage of the PBL as they continue to discuss their initial ideas. The teacher will continue to remind them to see themselves as an ‘engineer’ that has been assigned a task that they will need to help solve over the next few weeks.

**Understanding the Problem**

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| **Teacher** | **Student** |
| 1. The teacher will start by showing slides 6 & 7 of the PPT that define what ‘foreign object debris’ or F.O.D. is and shows 2 examples of how F.O.D. affected an airplane. (PP 3-4) plus training video on F.O.D. | Students will take a few notes on F.O.D. and try to identify a few of the items in images on slide 6 (the definition slide).  Students will brainstorm how other items can become F.O.D.  Students will use a Mentimeter to determine if the pictures are F.O.D. or not. |
| 1. The teacher will individually go through the 5 different pictures of ‘possible’ F.O.D. objects (such as an eggshell in cookie dough or a wrench in a toolbox). After each object, the students will choose their answer. Once everyone has ‘voted’, discuss the results and assess for any misunderstandings. | Students will look at each object and analyze whether it fits into the definition of a F.O.D. object. They will ‘vote’ using Microsoft Forms poll or Mentimeter survey on whether they think the object is or isn’t F.O.D.  Students will be ready to discuss and defend their answers during a class discussion. |
| 1. The teacher will initiate a discussion of how this might fit in with our initial problem in our scenario from yesterday. Teacher will create a list on the board or Smartboard of initial ideas. | Students will infer what other objects might be considered F.O.D. They will brainstorm ideas for what might be causing our unusual noise. |

**Accommodations:** Students with special needs or accommodations (IEPs or 504s) can have some extra one-on-one time with the teacher(s) to help clarify the definition of F.O.D. and provide additional support as needed. Students can also work with a partner versus alone for the entire lesson to help them clarify and communicate their ideas.Finally, a student might be given a print-out of the PPT slides and/or more time to answer the ‘poll’ questions.

**Extensions:** Students can create their own assessments with scenarios of potential F.O.D. or the most ‘unusual’ incidences of F.O.D. (Fairly Odd F.O.D.) - ADD a notice to teachers about this!!

**Assessment:** Students fill out form on scenarios in real time, see how whole class did via graphic from Mentimeter or looking at the Microsoft Forms poll graphic

**References/Resources:**

* PPT [FOD.pptx](https://seattleschools-my.sharepoint.com/:p:/g/personal/kywong1_seattleschools_org/EetEQOVn05BCh_Qp8N6I5wMBq__6IeYKeGdOgMDZiVMvTA?e=UiyIDn)
* Boeing video (or other FOD definition video)