

University of Portland  
ME421 – Failure Analysis  
Fall 2013, Assignment #1

Answer the following questions regarding the Comet Airplane. All answers should be concise (one or two sentences).

- 1) What were the leading theories as to the cause of failures from the first accident through the last?
- 2) As stated in paragraph 16 (pg 2-13) “all testing is to some extent a compromise.” In what ways was the original fatigue testing not representative of real-life conditions?
- 3) What justification was there for the belief that if the cabin survived undamaged when tested statically to 2P it would not fail in service due to fatigue? (ref paragraph 18).

These are not related to the comet, at least not specifically:

- 4) The new Boeing 787 Dreamliner is the first Boeing Commercial airplane to be constructed almost entirely from graphite/epoxy composites. Do you think Boeing is potentially following in the same path of de Havilland with pushing the limits of aluminum on the Comet? Briefly justify your answer (1 or 2 paragraphs, ½ page maximum).
- 5) *As we will be discussing in class this semester, failure can often be avoided if someone notices that “something doesn’t seem quite right” and then acts upon that concern. There are also many examples in history of someone noticing something “unusual” (or sometimes quite common) and turning it into something very noteworthy. Conclusion: pay attention! Read chapter 6 in “They All Laughed” (link on the course web page). Briefly (1 paragraph, ¼ page max) summarize the main points of the chapter.*
- 6) *Here is our first technical problem of this class. You should have the knowledge (or know where to obtain the knowledge) necessary to analyze this failure: A failed structural part is made from 2024-T351 aluminum alloy. You have no knowledge of the temperature that the part actually experienced during its use. Describe what observations or testing could be done (if any) on the failed part to determine if elevated temperature contributed to the failure. How would elevated operating temperature affect the material? What temperature would potentially lead to a failure? Be as specific as you can.*
- 7) There will be a project this semester where you will conduct a failure analysis of a failed part. This will be a team project with two or three students per team. Please select your own team and provide their names with this assignment.

Homework format: for “traditional calculation based” assignments, you must follow the standard hw format (given, find, etc.). For all assignments, it must be clear what the question is that you are answering and what your answer is. For example, for “essay type problems” such as problem 2 above could be written as:

Q: In what way was the original fatigue testing of the Comet airplane not representative of real-life conditions?

A: *Insert your highly thought-out answer here.*