

Open Ended Problem #7
The REAL castaway
GROUP WORK OKAY, Due 11/6/24 at beginning of class
(Don't be afraid to "Google" good assumptions!)

[The Martian](#)

After 18 days on Mars (well, actually 18 sol, but it's close enough), a massive storm forces the abortion of the first manned mission to Mars. Astronaut Mark Watney is unfortunately standing in the wrong place at the wrong time, and he is smashed out of line by a communications array that was knocked off the hab by the wind. Apparently the storm wind force of 8.6 kN was enough to knock this array loose. What is the wind speed required (on the Martian planet) in order to create 8.6 kN of force on the communications array dish? (hint – we're talking about a force caused by fluids here...)

- 1) What is this problem actually asking for?
- 2) Draw a sketch depicting the conditions of interest.
- 3) a) What physical laws apply to this problem?
b) Indicate equations, correlations, and/or formulae that can model these laws.
c) What are the potential limitations of these equations?
- 3) What assumptions should be made?
a) List ALL the assumptions that you need to in order to solve the problem.
b) Justify your assumptions (references, reasoning, judgment, common sense, etc.)
- 5) What are the physical properties used in this problem?
- 6) Calculate the quantity that you listed in part 1 (be sure to include intermediate values).
- 7) Verify your answer... Does it look reasonable? Anything odd about the calculation?
a) Re-evaluate the answer in part 6 assuming that you are on earth. What rating of tornado and hurricane would this wind speed be equivalent to?
b) What angle (or range of angles) would the array need to have hit Mark at in order to knock him as shown in the movie?
c) Assuming that the wind speed on Mars is limited to sonic velocity, what is the maximum force that could be seen in such a storm?