Engineering Extended Application Exercise

Course:

- University of British Columbia, MECH 223 (Mechanical Design Introduction)
- Second-year core course for Mechanical Engineers
- Approx. 125 students in 20 teams

Activity Objectives:

- Apply estimation, modelling, and uncertainty analysis to a complex, ill-defined problem
- Recommend, with convincing justification, an appropriate decision

Activity Duration:

- Approx. 4.5 hours of in-class work time with targeted mini-lectures from instructor as needed
- Approx. 30 minutes class discussion and instructor-led debriefing

Activity:

- Develop three supplied basic concepts into workable solutions for a mechanical design competition
- Model the concepts; estimate the performance and the associated uncertainty for each one
- Recommend next steps

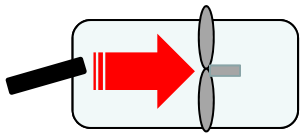
Reporting and Debriefing:

- Teams placed a post-it note with their team name under one of six different choices on the board (i.e. Choose Concept 1 or 2 or 3, or Reject Concept 1, or 2, or 3).
- Discussion / debate / debrief followed

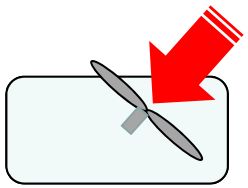
Selection under Uncertainty 1 of 2

- **Consider** the three concepts in terms of the manoeuvring scenario related to your project
- **Model** the physics and **estimate** value, *V*, and the corresponding uncertainty for each concept
- **Recommend** a course of action:
  - Advance one concept (which one) and drop the other two
  - Drop one concept (which one) and study the other two in more detail

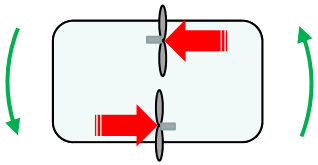
Selection under Uncertainty 2 of 2



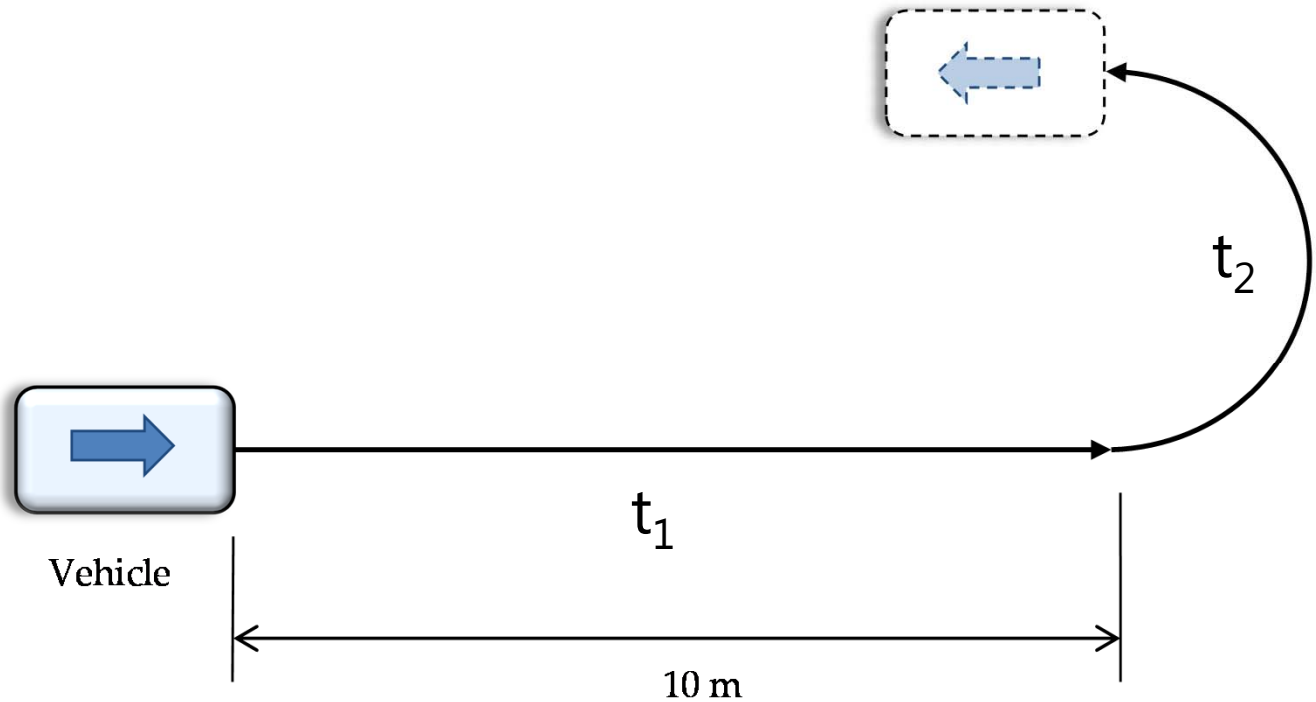
Concept 1
Rudder Steering



Concept 2
Vectorable Propeller



Concept 3
Differential Propellers



$$V = \frac{4 \text{ seconds}}{t_1 + t_2}$$