Aircraft Systems Field Exam - 2019

Below is an example of a V-n diagram for a commercial transport aircraft in a clean configuration.

1. Explain what sets the upper and lower bounds of the envelope as well as the right boundary of the envelope. You can ignore the lower right bound.

2. Discuss what design options you might have to increase the envelope in each direction. What are the tradeoffs in doing this.

3. How would you represent gust loads in this diagram. How would you determine the maximum turbulent air penetration speed.

3. $V_A$ is the maneuvering speed. Can you determine $V_A$ from this diagram.

4. $V_A$ is commonly represented as the speed where maximum sudden control deflection will not result in structural failure. Does the $V_A$ consider full rudder deflection. If not how would you determine the maximum load on the vertical tail and how would you protect against structural failure of the tail.

5. $V_{MC}$ is the minimum controllable airspeed with the critical engine inoperative. What is the critical engine and what design factors influence $V_{MC}$. 