Yale College
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Conceptual Design and Prototyping of the Hyperloop

This past summer, I had the great privilege of working for the National Aeronautics and Space Administration (NASA) as a Multidisciplinary Aeronautics Research Team Initiative (MARTI) member. In my research team, I worked on conceptual engineering design and hardware prototyping of the Hyperloop, a high-speed transportation concept with the potential to revolutionize the way we travel. Being a Global Affairs and Cognitive Science double major specializing in artificial intelligence and machine learning, the chance to work at one of the premier engineering research institutions in the world was a dream come true. I wanted to contribute to groundbreaking research while also further developing my passion for technology policy.

Today, the short-haul aviation market operates at extreme sub-optimal conditions. More than half of all the world's commercial aviation performs flights less than 500 miles, yet aircraft are not at all suited for traveling such short distances. Planes spend a significant amount of time de-boarding, boarding, performing holding patterns, climbing to and descending from cruising altitude. The Hyperloop is a proposed technology with the potential to throw out all of these inefficiencies by bringing the entire trajectory of the mission down to the ground, thus ensuring a faster, cleaner, and cheaper option. Our research goal this summer was to design the first-ever full-system model of the Hyperloop and perform trade studies analyzing both its engineering and economic feasibility.

In a nutshell, the Hyperloop is a high-speed transportation system that propels passengers in a pod levitated inside of an evacuated tube. While a conventional plane wastes a lot of energy getting up, and coming back down from cruising altitude, flying close to the ground bypasses these inefficiencies entirely while maintaining the optimal speed achieved by aircraft of Mach 0.8 (620mph). In order to explore the feasibility of this concept, I built a full-system software model in Python, leveraging both the research that aerospace engineers have already done as well as the work my team conducted, to analyze the Tube and Pod sub-systems and how they integrate within the Mission trajectory and Cost modules. Using this model, I performed trade studies of various couplings within the model to derive conclusions that aid in achieving an optimal system. In August of 2016, my team and I presented our work to the Director of Aeronautics of NASA, and future collaboration between our agency and the Department of Transportation may be potentially realized.

In the time that I've left NASA, I've continued building on the work that I started this summer. Our team is in the process of submitting 2 papers for publication, one describing our proposed system model and derived conclusions and another on the electric motors and turbomachinery that we've prototyped. This upcoming January, I hope to secure the necessary funding that would allow me to attend SciTech 2017 and present this work to the aeronautics industry. I hope to attend graduate school in the future to continue my research in artificial intelligence and robotics, and ultimately work with policymakers to ensure a future that is safe and prosperous for all. I would like to sincerely thank the Class of 1960 John Heinz Government Service Fellowship, for without the support of the fellowship, I would not have been able to do the work that I did this summer.