SENATE COMMITTEE ON COMMERCE, SCIENCE & TRANSPORTATION

TESTIMONY OF JOSH RAYCROFT
VIRGIN HYPERLOOP ONE

Chairman Thune, Ranking Member Nelson and distinguished members of the committee, I want to thank you for inviting me to testify today about the exciting innovation happening at Virgin Hyperloop One.

My name is Josh Raycroft, and I am the Director of Business Strategy at Virgin Hyperloop One in Los Angeles. Prior to joining Virgin Hyperloop One, I worked as an engineer at GE Aviation, so it's very gratifying to be able to testify here along with GE Transportation and other great companies and agencies on the cutting edge of transportation technology.

We are a U.S. company that has now grown to nearly 250 employees, and I have had the unique opportunity to watch the company grow from just 20 employees when I joined three years ago. We are -- by far -- the leading company in the world in advancing hyperloop technology, and in those three years, we have accomplished amazing achievements that I look forward to sharing with you this morning.

I will start with a brief definition of hyperloop technology. The term "hyperloop" is shorthand for what may better be described as a low pressure high speed surface transportation system. Travel occurs within an enclosure that maintains very low atmospheric pressure while the vehicle is pressurized to normal atmospheric conditions – much like a commercial aircraft. The benefit of the low-pressure environment is that it all but eliminates aerodynamic drag on the vehicle, which allows it to reach very high speeds and maintain those speeds with much less energy.

Anecdotally, I would describe the concept as follows: when you are driving a car and you put your foot on the gas pedal, you accelerate. When you take your foot off the gas pedal -- you begin to decelerate. You slow down because of the effects of aerodynamic drag. In a hyperloop environment, the low pressure nearly eliminates the aerodynamic drag, and when you take your foot off the gas pedal, you can continue to go fast and maintain your speed for a very long time. Therefore, you can reach very high speeds on much less power than conventional surface transportation.

After initial experimentation, evaluation and testing, we settled on a design for our system that utilizes electromagnetic propulsion to move the vehicle and magnetic levitation rather than wheels. The electromagnetic propulsion is similar to an electric car's motor, except that instead of moving in a rotary fashion to turn the axle, the motor moves in a linear manner to propel the vehicle forward.

The magnetic levitation system we utilize is dramatically different from the foreign systems developed many decades ago. Those systems, while engineering marvels at the time, use massive amounts of electricity to accomplish their levitation or require extremely precise construction and maintenance techniques that dramatically increase the installation and operating costs of the system. By contrast, our proprietary levitation system operates with larger tolerances on the track, making it easier to construct and maintain. Furthermore, our system uses significantly less energy than other maglev systems, making it less expensive to operate.

In late 2015, we began building the first scaled prototype of our propulsion system. We demonstrated this to the world in May 2016. In November 2016, we began to build our first full-scale and full-system test site, which we call "DevLoop" in the desert 30 miles north of Las Vegas. We built on land controlled by the Bureau of Land Management (BLM), and I want to compliment the state of Nevada and the Nevada Senators on this committee for the very efficient and effective way that we were able to move through the permitting process to build and begin operations on this site. I also want to recognize Tina Quigley, who is on this panel, for all of her leadership and work with us in southern Nevada.

We completed the construction of DevLoop within six months and began testing in May 2017. This test bed is a 500-meter full scale hyperloop system incorporating all of the elements of the system: A prototype pod vehicle, a low-pressure enclosure to nearly eliminate aerodynamic drag on the vehicle, an airlock, magnetic levitation, electromagnetic propulsion, power electronics and a control system.

Over 400 tests have been performed at DevLoop on all aspects of the system. On May 12, 2017, we had our "Kitty Hawk" moment, successfully completing the world's first full system, self-powered hyperloop test, marking the inaugural run of this new mode of transportation. In December 2017, on only 300 meters of acceleration, we reached speeds of 240 mph.

I would now like to show you a short video from these historic tests.

As you saw in the video, our vehicle is unique. We call our vehicle a "pod". It's not a train. We will run individual pods carrying 20-25 passengers or cargo traveling direct to their destinations on demand. There are no fixed schedules or stops at intermediate stations. The pods are moved by centralized and onboard control systems to maximize the safety and efficiency of the system.

Based on hundreds of tests at the DevLoop site and thousands at our headquarters in Los Angeles, we have integrated major improvements into our system. As we move rapidly toward commercialization, we have started engagement with various agencies across the U.S. studying the feasibility of a hyperloop system in their state and region. In two cases, these projects are advancing toward environmental permitting and the NEPA process.

In Colorado, the Colorado DOT's RoadX program is partnering with Virgin Hyperloop One to study the feasibility of a statewide hyperloop network. The engineering firm AECOM is servicing the state and Virgin Hyperloop One for the study, which is expected to be completed this Fall.

In the Midwest, we are partnering with the Mid-Ohio Regional Planning Commission (MORPC) on two projects: A feasibility study of hyperloop between Pittsburgh, Columbus and Chicago;

and a Tier 1 Environmental Impact Statement on the corridor considering both high speed rail and hyperloop technologies.

In Missouri, Virgin Hyperloop One is partnering with the University of Missouri System, the St. Louis Chamber of Commerce, the Kansas City Tech Council and the Missouri Hyperloop Coalition to study the feasibility of a hyperloop along I-70 in Missouri servicing St. Louis, Columbia and Kansas City. The global engineering firm Black & Veatch, based in Kansas City is running the study, which will be completed this fall.

In Texas, the Dallas-Ft. Worth Regional Transportation Council (RTC) announced that it will conduct a Tier 1 Environmental Impact Study (EIS) that will consider both hyperloop and high speed rail for the 30-mile corridor between Dallas and Ft. Worth. In addition, the RTC announced that it will conduct a Feasibility Study of a longer route from Ft. Worth to Laredo. That study will explore both hyperloop and rail options for the corridor. The sponsors plan to move this project into an EIS following completion of the Feasibility Study.

On the Federal side, we plan to expand our engagement with the U.S. Department of Transportation and the Federal Railroad Administration (FRA), which has jurisdiction over our system under 49 U.S.C. §20102 (2)(A). Safety is our number one priority for this system and is an overwhelming focus of our design engineers. We want to work with the FRA and this committee to develop the appropriate safety regulatory framework for our system that will ensure stringent safety measures.

We also believe that as a "railroad" under Federal law, projects utilizing our technology should be eligible for relevant Federal programs designed to support these projects, such as RRIF, TIFIA, formula and discretionary grants and other project finance tools. Clarity of the Federal regulatory and financing framework for this system should be a high priority for USDOT and FRA because of the transformative potential of this American technology.

We believe hyperloop technology would add tremendous value to our existing transportation system. Today, our road, port, airport and rail systems face congestion and capacity challenges. The addition of hyperloop systems would address these and other issues our transportation system faces.

Hyperloop has the potential to change not only the way people live and work, but also the movement of cargo in supply and distribution chains. Speed and time savings will expand opportunities for people and businesses, allowing people to live in less densely populated communities while having access to jobs, services, and entertainment in central metro areas. Furthermore, a small business owner could locate his or her company in a smaller city or rural area but still have the same access as a company located in a city center. Hyperloop systems also allow for faster and more reliable movement of goods and parcels, enabling businesses to react to supply chain shocks on a more nimble basis. We are working with port operators and rail companies to study and operationalize some of these exciting cargo concepts.

Virgin Hyperloop One is well on its way to building the next generation of high speed ground transport. We have an opportunity to develop and implement this technology here right here in

the United States. We look forward to working more with this committee and USDOT as we commercialize our technology.

Thank you Chairman Thune and Ranking Member Nelson for inviting us to testify today.

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