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Opening Space with a 'Transorbital Railroad'

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In the history of the American frontier, the opening of the transcontinental railroad was an epochal event. Almost instantly, the trip to the West Coast, which had previously required an arduous multi-month trek and a massive investment for an average family, became a quick and affordable excursion. With the easing of commerce and communication

across the continent, economic growth rapidly accelerated, creating new industries, new prosperity, and new communities.

Can we today deliver a similar masterstroke, and open the way to the full and rapid development of the space frontier? Can we open a "transorbital railroad"? Here's how it could be done.

First, we could set up a small transorbital railroad office in NASA, and fund it to buy six heavy-lift launches (100 tonnes to low-Earth orbit) and six medium-lift launches (20 tonnes to low-Earth orbit) per year from the private launch industry, with heavy- and medium-lift launches occurring on alternating months. (A tonne is a metric ton—1,000 kilograms, or about 2,200 pounds.) The transorbital railroad office would pay the launch companies $500 million for each heavy launch and $100 million for each medium launch, thus requiring a total program expenditure of $3.6 billion per year—roughly 70 percent of the cost of the space shuttle program.

NASA would then sell standardized compartments on these launches to both government and private customers at subsidized rates based on the weight of the cargo being shipped. For example, on the heavy-lift vehicle, the entire 100-tonne-capacity launch could be offered for sale at $10 million, or divided into 10-tonne compartments for $1 million, 1-tonne subcompartments for $100,000, and 100-kilogram slots for $10,000 each. The same kind of pricing could be offered on the medium-lift launcher. While recovering only a tiny fraction of the transorbital railroad's costs, such low fees (levied primarily to discourage spurious use) would make spaceflight readily affordable.

As with a normal railroad here on Earth, the transorbital railroad's launches would occur in accordance with its schedule, regardless of whether or not all of its cargo capacity was subscribed by customers. Unsubscribed space would be filled with containers of water, food, or space-storable propellants. These standardized, pressurizable containers, equipped with tracking beacons, plumbing attachments, hatches, and electrical pass-throughs, would be released for orbital recovery by anyone with the initiative to collect them and put their contents and volumes to use in space. A payload dispenser, provided and loaded by the launch companies as part of their service, would be used to release each payload to go its separate way once orbit was achieved.

As noted above, the budget required to run the transorbital railroad would be 30 percent less than the space shuttle program, but it would accomplish far more. Since its inception in the early 1980s, the space shuttle

program has averaged about four launches per year. Given the shuttle's theoretical maximum payload capacity (rarely used in full) of about 25 tonnes, this means that the shuttle program could be expected to deliver no more than 100 tonnes to low-Earth orbit per year. By contrast, the transorbital railroad would launch 720 tonnes per year. The U.S. government would thus save a great deal of money, since its own departments in NASA, the military, and other agencies could avail themselves of the transorbital railroad's low rates to launch their payloads at trivial cost. Much further savings would occur, however, since with launch costs so reduced, it would no longer be necessary to spend billions to ensure the ultimate degree of spacecraft reliability. Instead, commercial-grade parts could be used, thereby cutting the cost of spacecraft construction by orders of magnitude. While some failures would result, they would be eminently affordable, and moreover, enable a greatly accelerated rate of technological advance in spacecraft design, since unproven, non-space-rated components could be much more rapidly put to the test. With both launch and spacecraft costs so sharply reduced, the financial consequences of any failures could be readily met by the purchase of insurance by the launch companies, which would reimburse both the government and payload owners in the event of a mishap.

With such a huge amount of lift capability available to the public at low cost, both public and private initiatives of every kind could take flight. If NASA desired to send human expeditions to other worlds, all it would have to do would be to buy space on the transorbital railroad for its payloads. But private enterprises or foundations could use the transorbital railroad to launch their own lunar or Mars probes—or settlements—as well. Those who believe in solar-power satellites would have the opportunity to put their business plans into action. Those wishing to operate orbital space hotels would have the launch capacity necessary to make their concepts feasible. Those hoping to offer commercial orbital ferry service to transfer payloads from low-Earth orbit to geostationary orbit or beyond would be able to get their crafts aloft, and have plenty of customers. As such enterprises multiplied, a tax base would be created both on Earth and in space that would ultimately repay the government many times over for its transorbital railroad program costs.

While the implementation of a cargo-only transorbital railroad would be a great advance over our current situation, we should not exclude using it to transport human beings as well. As John F. Kennedy said at the dawn of the space age, "We go into space because whatever

mankind must undertake, free men must fully share." The transorbital railroad's compartments should thus be open to receive passenger capsules provided by private vendors, thereby making affordable trips to orbit possible for anyone. Some might say that such open access to human spaceflight would put people at risk. This is true. But bold endeavors have always involved risk, whether personal or financial, and free men and women should be allowed to decide for themselves what risks they are willing to accept in order to achieve their dreams. This would free our space effort from the crippling constraint of excessively risk-averse government bureaucracy.

We don't have to wait years to implement the transorbital railroad. We already have the capability to begin it right away, with twelve medium-lift launches per year using existing Atlas V, Delta IV, and Falcon 9 rockets. This would cost only $1.2 billion yearly, so if the program were fully budgeted from the beginning, more than $2 billion per year would still remain to support the development of heavy-lift vehicles through two or more fixed-price contracts issued on a competitive basis. Once these heavy-lift launchers became available, the full transorbital railroad service would be enabled. With a guaranteed market, launch vehicle companies would be able to put mass-production techniques into action, thereby causing the costs of their rockets to fall over time. This, in turn, would allow the transorbital railroad to further increase the frequency of its service, from one launch per month to two, three, or more, and would result in a dramatic drop in the cost of launch vehicles bought outside of the transorbital railroad program as well.

Some critics might argue that the implementation of the transorbital railroad would represent an anticompetitive subsidization of the U.S. launch industry. But the federal government has always subsidized transportation, supporting the development of trails, canals, railroads, seaports, bridges, tunnels, subways, highways, aircraft, and airports since the founding of the republic. Creating an affordable transportation infrastructure is one of the fundamental responsibilities of government. Meanwhile, international competitors in Europe or Asia who might be inclined to complain about anticompetitive behavior could create transorbital railroads of their own, thus multiplying even further mankind's capacity to reach into space.

Within a few years, we could be sending not a mere handful of people per year to orbit, but hundreds. Instead of a narrow space program with

timid objectives moving forward at the snail's pace of politically constrained bureaucracy, we could have dozens of bold endeavors of every kind, attempting to realize every vision and every dream—reaching out, taking risks, and proving the impossible to be possible. With the aid of the transorbital railroad, the vast realm of the solar system could be truly opened to human hands, human minds, human hearts, and human enterprise: a great new frontier for free men and women to explore and settle, their creativity unbounded, with prospects and possibilities as unlimited as space itself.

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