Air Travel Is the Future. It Needs to Be Not Miserable.

Hyper-connected cities and the art of easy travel – year 2050

HeroX Infrastructure 2050 Challenge
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Air travel is the future. More people are taking more flights as the world grows increasingly interconnected. The internet, which was originally anticipated to reduce the need for physical travel, has actually done quite the opposite – it has allowed people to enter a digital, globally connected world with limited barriers. This has, paradoxically, driven our desire to connect in the physical space rather than decrease it. Both people and products are crossing vast distances and borders like never before – and much of that is happening via air. In fact, since 2000, air travel has doubled[1] – and it shows no signs of abating. Air cargo has, likewise, experienced a jump in volume over the same time – almost 60%[2]; growth that occurred despite a global financial crisis and contraction in emerging economies. Air is here to stay – and it will only grow to be a bigger part of our world in the future.

But while the world has taken to the miracle of flight, the tremendous volumes of people and products passing through the world's airports have made air travel miserable, inconsistent and unreliable.

This is a problem. And it is a significant problem.

On your way to the airport, wouldn't you dread seeing this?

To understand how much wealth creation is generated by airports, one must simply look at landlocked cities like Dallas and Atlanta whose fortunes have been transformed by their enormously hyper-connected airports. In the master-planned suburb directly abutting Dallas/Fort Worth International Airport (DFW), Las Colinas, over 2,000

corporations and 400 corporate headquarters have made their homes. Proximity to the airport is a key reason why companies choose Las Colinas over downtown Dallas – a point that was reinforced when the suburb added a light rail providing service directly into the airport[3].

Over the past 50 years, cities like Chicago, London, Atlanta, Dallas and Amsterdam have made airports a central part of their city economies. Rolling into the 21st century, new emerging power cities like Dubai, Beijing and Zhengzhou, are building massive airport complexes that will hyper-connect their cities to the world, too. This creates incredible opportunities for these cities, as exemplified in the case of Zhengzhou, China. Their airport has landed them large manufacturing sites like Foxconn which can produce Apple products and immediately transfer them to the airport where they can be air shipped around the world in a rapid and seamless manner[4]. In a digital world of immediate gratification – speed matters – and airport cities have speed.

Moving into the future, towards 2050, airports will no longer serve as differentiators for some cities that want to capitalize on the airport economy. Instead, cities that are not plugged into a hyper-connected airport will be overlooked for business, tourism and growth opportunities. Robust airports will be an imperative.

To move forward, cities will need to radically expand their airports and reduce the friction that exists between the starting point and the end point of a journey. By increasing the size of their airports, cities create growth and interconnectivity – simply put, larger airports have more flights, greater network effects and more global touchpoints with fewer transfers. And by decreasing friction and increasing seamlessness, cities can enmesh airports into the overall fabric of their mass transit systems and make flight a natural commuting option.

How do cities achieve this growth and seamlessness? Especially in an environment of land scarcity and increasing travel and security barriers?

The answer is to deconstruct the airport and turn the area where planes take-off and land, whether with people or cargo, into dedicated airfields. Then place the front doors

of the airport – the portals in which people enter and engage with the airport – around the city. These front doors are then linked with high speed pods to the airfield.

Imagine, for example, San Francisco. Today, one of the most heavily trafficked airports in the United States, San Francisco International Airport (SFO) sits about 15 miles south of downtown. On a typical day, one can expect to spend either 30 minutes on the subway or 30-90 minutes in traffic to reach the front doors of the terminal. And that's just the beginning. The airport user must take air train, and then check their bags and pass through security – which can take anywhere from 30-70 minutes. Finally, inside the secure area, the traveler makes their way to the gate. In this scenario, the airport is a centralized destination with over 25 tasks a person must complete in their airplane journey – everything from sitting in traffic to removing shoes at security. It's not efficient, and well, let's be honest, the whole transaction is just miserable.

The Airport Transit Pod

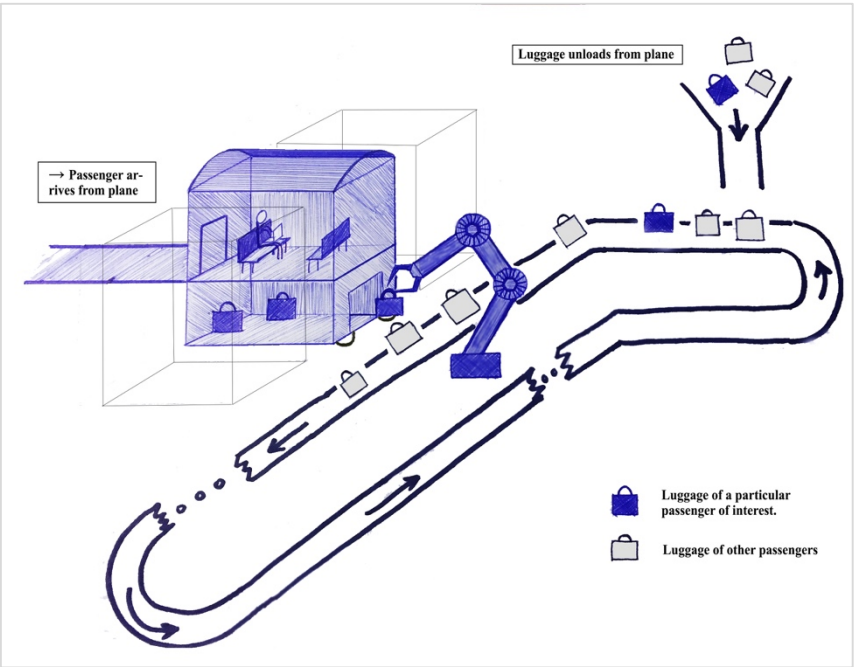
- Self-driving
- Holds up to six people. Americans with Disabilities Act compliant
- Travels at speeds up 80 miles per hour through dedicated tunnels, pathways and lanes

Experiencing the Pod

- Pod scans travel information from your personal electronic device
- The pod also scans for dangerous substances while onboard; if there's anything suspicious, the pod diverts to a designated area in the airport
- Luggage is stored in a compartment under the passenger level (like storing things under a bed); luggage will be handled automatically with an electric tracker that points to the location of traveler
- The pod travels directly to boarding gate, while luggage is automatically shuttled to plane loading area
- The pod then waits near boarding area to pick up the newly arriving passengers from the plane.
- As passengers disembark, luggage will be dropped onto a lower level conveyor belt, that is similar to current luggage conveyor belts in airports today. As passengers scan into pods, a mechanical arm will slot luggage into the lower level storage area of the pod.

But imagine for a moment that SFO was built differently: stations all over the city – perhaps one on Market Street in the heart of downtown, one at Moscone Center, one of the largest convention centers in the world, multiple in the suburbs around the city like Palo Alto (home to Stanford University) and Berkeley (home to, well, University of California, Berkeley). At these stations you load your luggage into a self-driving pod that travels through tunnels and dedicated lanes around the city to the airfield at SFO. While in the pod en route to the airport, all security measures are completed: bags are

scanned and explosives "sniffed out." If necessary, you will be alerted and diverted to a secure area for additional screening. Once you arrive to the airfield, the pod takes you directly to your plane's gate. Your bags are deposited automatically in the cargo loading area for your flight and all you do is board once the plane is ready. Leaving the airport is essentially a reversed process. After disembarking from the plane, you simply walk to one of the pods waiting at the gate. The pod would detect your identity and your luggage would be automatically inserted into the luggage compartment of your pod.



This is an example of a pod preparing to leave the airport. The passenger waits as their luggage is automatically loaded from the plane.

It's as easy as changing trains in a subway stations. And more importantly, it fundamentally alters the way we interact with air travel.

At first blush, this might sound like an elaborate taxi scheme – or worse yet, a luxury that will be rendered obsolete by the autonomous driving car. But we believe this approach runs deeper than just providing a ride to the airport lobby – it's about excising friction from the air travel process so that boarding a plane is almost akin to changing subway trains at Times Square Station. The idea is to make air travel as ubiquitous and seamless as other modes of transportation. *See Appendix A for maps that demonstrates current and envisioned airport situation, as well as a map of possible portal locations in San Francisco.*

Pods, unlike cars, operate on a separate set of paths, tunnels and dedicated lanes that ensure that arrival times to the airport are consistent and not delayed by traffic – this reduces friction. And in fact, pods render the airfield component less critical. Today, airfields are home to parking garages, shopping areas, hotels, security, etc. In a pod oriented, decentralized airport, all of those functions would occur in the city – where they belong. Thus, from any point in the city, an individual can pod-travel directly to their plane, check in and be ready for take-off. The airfield is no longer the one-stop-shop destination. Even more, the pod converts the commute into value-add time by checking and completing security protocols while in-transit, therefore reducing a significant bottleneck associated with air travel.

Using this hub-and-spoke pod network creates the following benefits for travelers:

1. **Creates consistency in user experience:** elements like traffic and security checks, which are unpredictable, are made more consistent.
2. **The process is automated:** the passenger has one access point close to home or work, and once ensconced in their pod, automated systems complete all other tasks like security, gate finding and luggage transfer.
3. **Promotes air travel and interconnectivity:** visitors to the city can quickly and easily access major points of attraction, like convention centers, universities and key tourist areas without having to think about logistics.
4. **Provides airfield flexibility:** where the airfield is located is of less consequence. Individuals and businesses interface with the portals, distributed across the city, and the pods transport people from those portals automatically at high and consistent speeds to the airfields. So if an airport needs to expand, but find themselves hemmed in by urban growth (Chicago, London, Los Angeles), this deconstructed and distributed model can provide a path to growth – simply move the airfield and link it to the pod network. Additionally, multiple airfields can be linked together with a rapid pod network allowing passengers to land at one airport, like Heathrow, but quickly depart from another airport, like Gatwick – all without having to engage with traffic and security protocols which hamper seamlessness.

The technology that drives this vision is already in place, or very close to development. Self-driving pods have been tested in multiple markets traveling along slender lanes – akin to a bike trail – that could be easily constructed in easements along interstates. Security features that "sniff" explosives and x-ray luggage are also available. The technology is on the cutting edge, but it is not the key element. Rather, it is reinventing the process by which we engage with airports that is fundamentally different.

Cities that make air travel easy and accessible will be rewarded with more travelers and more flights. This only further increases the value of the airport as a hub of global interconnectivity and economic growth. Not only is this true in terms of moving people, but also goods – in this model, physical goods can be directly channeled quickly through the airport conduit and to its destination. For the most hyper connected airport cities, it is possible that products will no longer need to be filtered through sorting facilities, but will instead travel on cargo air shuttles that run directly between cities on a reoccurring basis. This fundamentally changes how people and goods move through air – and by making the process faster, easier and more seamless, cities can expect to see increased passenger and cargo activity.

Cities like London, with multiple airports, can now link those airports together with pod-lanes – which essentially means that one can land at Heathrow International Airport in London, but take off on a connecting flight from Gatwick Airport. Today, that journey will take you 1-2 hours and is highly dependent on traffic on the M3 motorway. Pods would reduce this journey to 20 minutes and would create consistency in timing. This in essence provides airports like Heathrow the opportunity to tacitly expand their capacity without adding friction for passengers.

Today, airports process over 208 billion revenue ton kilometers (RTK)[5] of cargo a year, a number that has been increasing by an average of 3.2%[2] a year for the past decade – and it will only increase. Self-driving pods can be designed to move high value goods and mail directly to downtown areas and key business districts.

For example, 25 miles (but often times 60-90 minutes) from San Francisco International Airport sits Berkeley, a suburb that is home to University of California, Berkeley – not only would a portal connecting the university town benefit students, faculty and visitors to the world-renowned school, but also vital lab equipment, biological samples and other important materials could be quickly and easily shuttled from the airport to

the research school's labs. It would be as though Berkeley were right next to the airport, rather than an hour away on the opposite side of the San Francisco Bay.

A majority of the cost to implement a decentralized, pod-oriented airport strategy would be pod-development and creating the networked infrastructure across a region to tie portals (those front doors) back to the airport. Some cities might choose to exercise more traditional measures to fund these transformations – for example bonds or private/public partnerships. But our favorite is a model that can be borrowed from the construction of the Japanese high speed rail lines in the 1970s. Office parks, convention centers, hotels and other entities that benefit most from global interconnectivity can pay an excise tax that funds an airport portal close to their offices, factories, convention sites and hotels. Additionally, stations built in the suburbs can sell land parcels to high density developers close to the station entrance and use this revenue stream to offset costs. This has the double benefit of ensuring stations are built in areas with significant demand and density, and providing a revenue source to cover development costs.

But ultimately, the cost of building hyper-connected airports that are enmeshed into their cities will be recovered in economic growth and increased flight activity; especially for cities that capture first mover advantage. There are simply endless possibilities once airports are expanded and deeply connected to the regions they serve.

Today, air travel has fundamentally transformed our world – and it continuing to do so. People love the ability to move across borders and regions with ease – but while the magic of flight has changed how we interpret space and distance, the process of engaging with flight at our airports has never been worse.

The best cities in the future will seamlessly connect their hyper-connected airports into the fabric of their transportation systems. And in doing so, they will link the businesses and people of their city to the world.

Sources:

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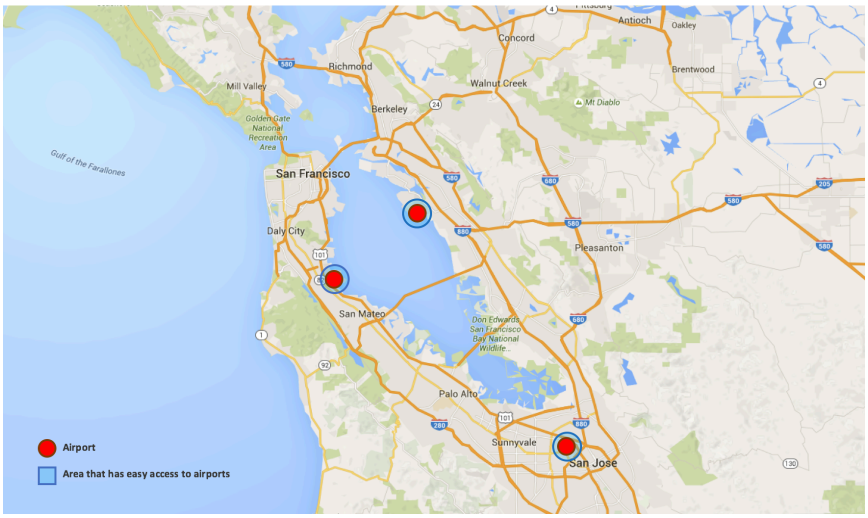
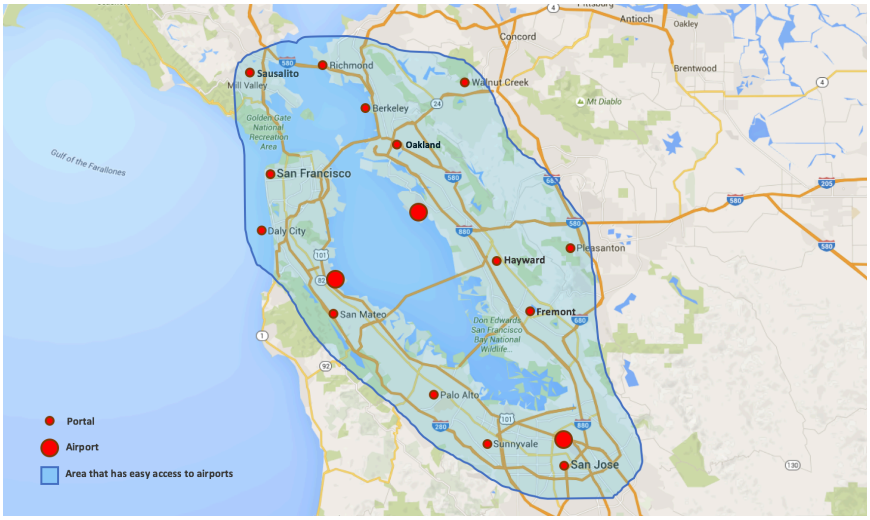
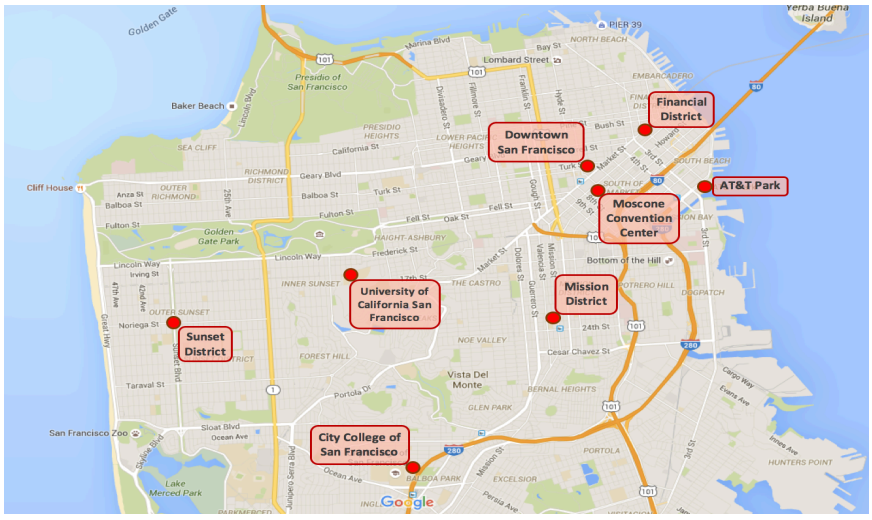
Appendix A:



Current airport locations in Bay Area



Decentralized portals all over the region serve as front doors to San Francisco's three main airfields



Examples of portal locations in San Francisco