High-Rise “Vertiports” and Other Near-Future Visions

For several years, Dallas-based architecture firm Humphreys & Partners has been involved in numerous forward-looking design projects that anticipate the increasing presence, if not ubiquity, of manned and autonomous flying vehicles, such as drones and “air taxis.” These include a technologically advanced high-rise called “Pier 2” as well as a “skyport” for Uber Elevate, the ride-sharing company’s air-taxi venture. Walter Hughes, Chief Innovation Officer at Humphreys, spoke with Daniel Safarik about the firm’s future high-rise visions.

How did your firm become interested and involved in architecture around flying taxis and drones?

We started looking at that many years ago. We did a building in Dubai in the early 2000s, and placed some landing structures on it without thinking too much about it. But then, in 2016, we did the first “apartment of the future.” For that project, we not only had flying taxis or electric vertical-takeoff-and-landing vehicles (eVTOLs), but also drone deliveries. We thought, “how would it change tall buildings when drones start delivering packages?” We had already started to see the impact of the huge growth of package deliveries in our projects, which would typically have a small storage space inside the leasing area, that were becoming overwhelmed daily due to volume growth of about 1 percent per month. These were conventional truck deliveries, of course, but then we saw that Amazon and others were developing drone delivery, and realized this was something we needed to look into.

So, in 2016 we started planning for it. In 2018, we did the apartment building Pier 2 in New York as a speculation, and it had the landing pads and everything else more sorted out (see Figure 1). Both manned flying vehicles and drone deliveries were taken into account. That got noticed, and we started growing our drone-based designs, and that led us to being invited to a large competition organized by Uber to design “mega-skyports.” These were to be structures able to handle 1,000 takeoffs and landings per hour, on a space of 3 acres (1.2 hectares). We were selected as one of the four finalists and invited to present our concept at Uber Elevate in Los Angeles in May 2018—that’s when we really started getting into it (see Figure 2). We got all the regulations, models and requirements, so we really learned about what was going on and what needed to happen. We learned what we, as a firm, would need to do to be ready for such a development. Uber ran the competition again in 2019, and we were again selected to present at Uber Elevate 2019 in Washington, D.C.

Is this entirely speculative, or are you hearing from your client base that they want to have high-rises developed that incorporate provisions for VTOL vehicles and drones?

I think there’s a lot of curiosity and people are asking about it. Most people I talk to seem skeptical about the whole thing, and they don’t realize that it’s something that’s going...
Does that have more to do with the flying technology or the buildings? The technology, for the most part, is there already. The biggest issue is regulation, which one of the biggest hurdles to these machines becoming an everyday part of your life. Regulating these vehicles is a very complex issue that falls under the jurisdiction of several agencies—and rightly so; safety is priority number one. The other issue is affordability. The dollars per mile are coming down every year, but they’re still noncompetitive at this point. Drone deliveries are strictly regulated, and we have provided landing pads for them in some cases, but that is not as cost-intensive as building a platform that can handle 150 flights an hour, and not only that—it also needs to move several hundred people an hour through a building and connect to all other urban mobility systems, including traditional modes.

So, there are drones delivering packages to your buildings, but not people? Correct. While drones delivering people will take a few more years to become a reality, package delivery via either surface or air is already here. There are several companies working on this, including UPS, Wing (an offshoot of Google’s parent company Alphabet), Amazon, and Uber. Some of them have recently received clearance from the Federal Aviation Administration (FAA) in certain parts of the United States.

There is more difficulty around carrying passengers to and from tall buildings. Safety and regulations are prime concerns, but cost is an issue as well. These vehicles that are being developed right now have the capacity for four or five passengers. If you add the cost of a pilot to operate the vehicle, then the cost goes up exponentially, through the roof. At this point, the population isn’t ready yet for flying in an electrically powered, automatically piloted vehicle. Public acceptance is not there yet. It might be a few years before people get into one of those. Initially, in the first few years we will see eVTOLs that are flown by highly trained pilots, transporting four or five people, which is outrageous in terms of cost. This is compounded by the fact that there is already a pilot shortage in the aviation industry, certifications need to be issued, and coordination with air traffic control needs to be undertaken.

And it is more complicated to design for the newer vehicles than with traditional helicopters and helipads, because the current battery endurance for eVTOLs is not where we would like it to be. They have to be recharged fairly frequently. It’s not like you can charge an eVTOL and take it out in the morning and fly the whole day—they hold a charge for less than an hour on average. Essentially this means you have to charge every time you land. You have to have one platform for charging and another for active takeoffs and landings.

On the autonomous side, you have the issue of cyber security and the threat of someone taking control of these vehicles, of which thousands could be flying through the city’s airspace. The technology for unmanned flying vehicles is ready—it’s just everything else around it that’s not. So, yes, packages are starting to be delivered by drones, but not people, just yet.

What are the accommodations you have made for package deliveries? Are there specialized trays or landing pavilions for drones?
The answer varies depending on building types, but essentially, they all have a few things in common. They all need to handle everything from traditional online packages, to groceries and dry cleaning on a daily basis. We start by providing a drone landing pad, meeting certain regulations regarding clearances, etc. This could be on-grade or high up on the building. In tall buildings, if drones land higher up, we designed a conveyor belt system where packages are dropped off, and carried away to the elevator by a chute, typically using the freight elevator, which delivers them to the main storage room. There, they are picked up by an agent, who puts them into an automated...
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storage system and instantly notifies the resident—via an app—that there is a package waiting for them. There are also smaller landing systems resembling mailboxes with landing pads on top, which use a short-wave transmitter and have a top lid that opens up and accepts the package once the drone is right over it.

Even without aviation entering into the picture, the overall sizes for package storage rooms in multi-unit residential buildings have quadrupled in size compared to what they were six or seven years ago. In some cases, we allocate up to 3 square feet (0.28 square meters) per unit. These storage areas obviously now need to be accessible 24/7 in order to retrieve contents, something that was not a requirement 10 years ago, and they need to handle items that need to be refrigerated.

What have you seen in your experience, on the delivery side?

On the delivery side, we have started to see street robot delivery systems. They can show up to a restaurant, get loaded with food and then direct themselves to their drop-off area. While they can carry around 20 pounds (9 kilograms) or so, it again means several provisions need to be made for them.

They are essentially coolers on wheels, with cameras, microphones, speakers and several sensors, moving at about 4 mph (6.4 km/h) on city streets and accessing buildings. While some of these accommodations are easy to make, for example in student housing campuses, they might not be that easy in pre-existing, larger and denser urban scenarios or multistory buildings.

To be clear, you don’t have a case where groceries or other packages are being delivered through high-rise windows? No. Not yet. There are several obstacles to that happening, among them privacy concerns. In most cases, groceries and other packages are delivered via the systems we have just discussed, to a centralized location from which it is either picked up by, or delivered to the tenant.

What is the closest you have gotten to something like Pier 2, which is loaded with just about every conceivable near-future building technology, in terms of a real project with committed development funds?

Pier 2 has everything you can think of technology-wise that will be available in the next five to 15 years. Now, the reality of things is that, for a project to get built, it needs to make economic sense and some of these technological solutions are either too expensive or have not been regulated yet, so they don’t make economic sense.

Recognizing this, Pier 2 was designed as a showcase of what is available now, and what will be available in the near future at a reasonable cost.

Could a Pier 2 accommodate something like the Volary “skyport” you designed for Uber, or are the concepts separate?

Yes, the concepts could be combined. Pier 2 essentially accommodates a Volary skyport. It did so before Uber actually set the requirements for their skyports. Package deliveries, via street delivery robots and drones, have also been taken into account since our 2016 “apartment of the future” concept. Both street package delivery via robots on wheels, essentially, and via air drone delivery. We’ve also looked at how to utilize the top level of an existing multistory parking garage, to provide all that is needed for eVTOL operation. We’re now looking at a three-tower complex that proposes having an integrated skyport that can accommodate three eVTOL landings simultaneously, connecting the landing pad through the building to existing urban mobility systems.

How have you taken the lessons learned and feedback received from the Uber Elevate and Pier 2 projects (or other skyport/drone-related projects) and incorporated these into existing work?

We have learned a lot, actually. We research, think forward, and see what we can apply to our day-to-day projects. All the drone research we have done, for instance, lets us understand much better what the package or the online retail market is doing today, and how to design for it. It also made us rethink how we handle our leasing areas, circulation, automated storage systems, access and drop-off areas, how parking garages should be designed, and even how to plan for reducing the amount of parking space in projects, should the autonomous vehicle economy take hold.

The building industry is often criticized for being slow to adopt new technologies. What is the incentive to spend so much non-billable time on projects like this?

For us, innovation is key. We need to always be working on new ideas, concepts, technologies and materials. In many cases, clients don’t see a need for some of the technologies or concepts we are presently working on, and they might be slow adopting them, but they will be needing them in the next few years. When that happens, when they are ready, we are prepared.