OVER, LLC Concepts for the Aerial Vehicle Autonomous Anchoring and Powering System (AVAAPS), and the Ramp, Platform and Bridgeplate System (RPBS)

For future, fully autonomous VTOL AVs to become a widely accepted form of transportation, they will need to be convenient and easy-to-use for cargo customers, walk-in passengers, and those with physical disabilities. The strategic design of AVs, and the strategic design and placement of load/unload parking structures is a primary factor in meeting these goals.
OVER proposes that all of the various types and sizes of parking structures provide covered parking garages to protect AVs, the AVAAPS, and the RPBS from rain and other weather. We propose that each parking garage contain OVER's patent-pending AVAAPS technology, to anchor and power all standard size AVs, regardless of manufacturer. We also propose that the RPBS be installed in at least one parking garage at each parking structure location, or on each floor of a parking structure that provides customers with load/unload capabilities, whichever is greater. The various types and sizes of parking structures, and the "standard size" parking garage is described in another concept paper, posted to our website (www.OVER-LLC.com) titled "*OVER Concepts - Landing Areas, Parking Structures, Parking Garages, and Helipads v2.pdf*".

The combination of OVER's AVAAPS and RPBS technologies will enable *mobility for all*, including passengers with wheelchairs, baby strollers, walkers, or rolling luggage, as well as cargo customers using various rolling dollies, bins, and other cargo containers. In our opinion, the implementation of the AVAAPS and RPBS technologies, within conveniently place parking structures, will be *essential* to providing an effective, efficient, and all-inclusive Autonomous Transportation System (ATS) – now and into the future.

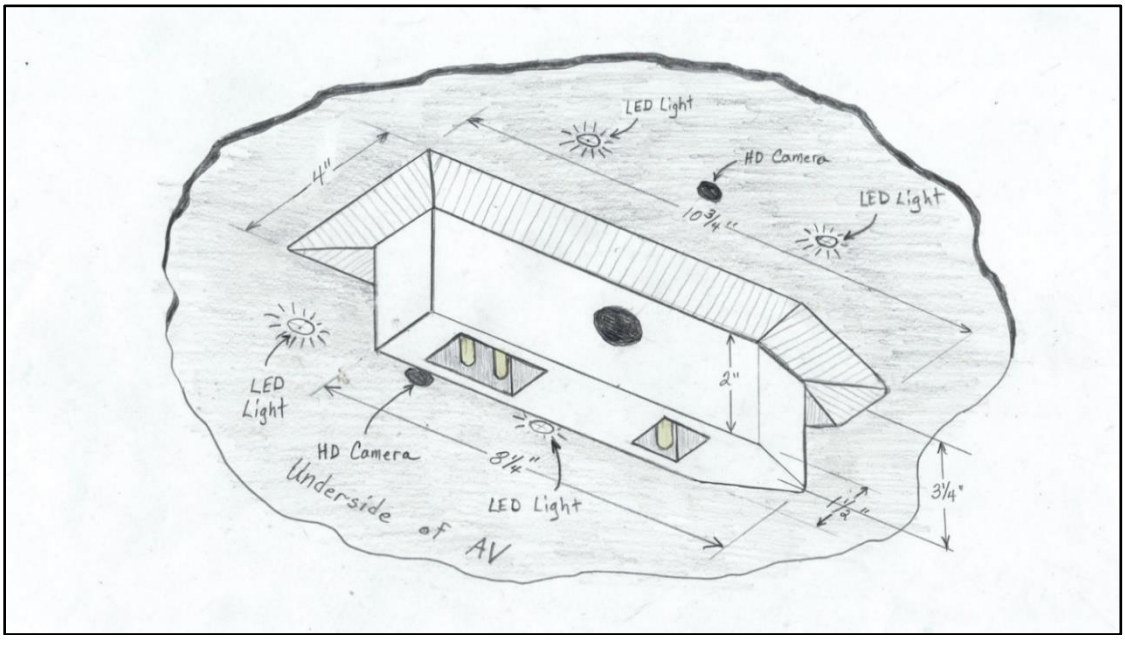
Aerial Vehicle Autonomous Anchoring and Powering System (AVAAPS)

OVER's patent-pending AVAAPS technology will automatically and autonomously anchor and connect electric power to fully autonomous VTOL AVs upon landing in a standard parking garage. It also automatically and autonomously un-anchors AVs and disconnects electric power upon takeoff. The AVAAPS will anchor AVs within seconds of landing, keep them anchored throughout the time they're parked, keep them from blowing off parking structures in high winds, facilitate safe loading/unloading of cargo and passengers, eliminate manual systems and tasks, reduce risks of injury and death to personnel, and reduce risks of damage to other aircraft, equipment and infrastructure. The AVAAPS is scalable, larger or smaller, but *one standard size and electric power configuration will be required* for all parking garages and all AVs, regardless of manufacturer. Although OVER's proposed size and power configuration (120VAC, single-phase, 50/60Hz) is illustrated below, the final standard size and power configuration is TBD.

The AVAAPS consists of two assemblies, the ***AV Assembly*** and the ***Pad Assembly***.

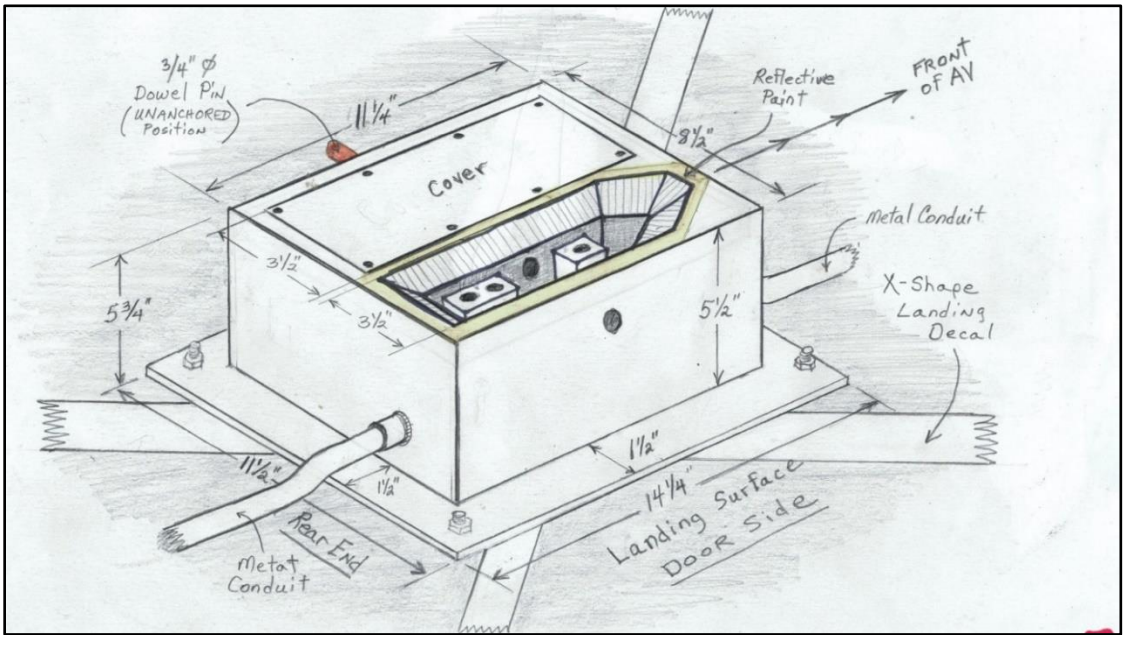
The AV Assembly, illustrated on the next page, would be factory installed on the underside of an AV's fuselage during the AV's manufacture. It includes the main "Blade" containing power pins and a dowel pin anchoring hole, four LED Lights, and two HD Cameras. Further, the AV Assembly circuitry in the AV will contain a wireless communication capability to connect to the Pad Assembly. The flight control system in each AV must be able to use the imagery from the HD Cameras to manipulate engine power and tilt with precision, to align the AV to the Pad Assembly. The entire AV Assembly and the Pad Assembly dowel pin will be made of a very strong, durable material such as titanium, with the balance made of high strength steel. The combination of small

size, high strength-to-weight ratio, and aerodynamic-shaped Blade provides a strong, unobtrusive anchoring device that will produce minimal drag or effect on flight performance.



AV Assembly

The *Pad Assembly*, illustrated below, is bolted or welded to the parking garage landing surface during the parking structure's construction. It contains the Receiver slot that will receive the AV Assembly "Blade". It also contains power sockets, the anchoring dowel pin (shown partially in retracted position), a small electric motor to move the dowel pin in/out of the anchoring holes, and a control circuit card that contains wireless communication capabilities, all of which are under the cover plate and not visible in the illustration. The exterior "box" may be constructed of steel plate, as shown, or injection molded with thermoplastic material such as Polyethylene.



Pad Assembly

Arrival Procedure: When a fully autonomous AV approaches within ~10 feet of a Pad Assembly, they will automatically establish a secure wireless communication link. (*The specific communications protocol is TBD*). The AV Assembly provides the AV's flight control system with two (redundant) video feeds, which are used by the AV to control engine tilt and power to autonomously align and land/seat the AV Assembly "Blade" into the "Receiver" slot in the Pad Assembly. The AV must align to the Receiver within a maximum tolerance of +/– 1 inch, or hover and re-position until within tolerance. As the AV Assembly Blade descends into the Pad Assembly Receiver, the electric power pins and sockets make contact and connect electric power to the AV. After landing, the autonomous AV automatically turns motor power OFF and transmits an "ANCHOR" signal through the wireless communication link. When the Pad Assembly receives the ANCHOR signal, its control circuitry applies +12VDC power to an electric motor, which turns a gear that moves a dowel pin (round gear rack) forward through a hole in the AV Assembly. When the dowel pin is fully inserted through the hole, the AV becomes anchored to the Pad Assembly. Additionally, when the Pad Assembly receives the ANCHOR signal, its control circuitry also applies +12VDC via Shielded Twisted Pair (STP) cable to the RPBS electromechanical actuator, which then *extends* the bridgeplate, as explained in the RPBS section on the next page.

Departure Procedure: When the fully autonomous AV applies electric power to its motors, the AV automatically transmits an "UN-ANCHOR" signal through the secure wireless communication link. When the Pad Assembly receives the signal, the control circuitry applies –12VDC power to the electric motor, which turns the gear in reverse to move the dowel pin backwards, out of the hole in the AV Assembly, which un-anchors the AV from the Pad Assembly. The Pad Assembly control circuitry also applies –12VDC via STP cable to the RPBS actuator, which then *retracts* the bridgeplate, as explained in the RPBS section on the next page. As the AV departs, electric power pin and socket connectors pull apart and electric power is disconnected from the AV.

The preferred AVAAPS power configuration is for single-phase AC power (120VAC, 50/60Hz) using 3 conductors, as illustrated. This design measures only 8¼" long x 1½" wide, and extend down only 3¼" from the bottom of the AV. A 3-phase 4-conductor AC version would be about 1" longer, and a 2-connector DC version would be about 1" shorter. (*One standard size and one power configuration is required for all parking garages and all AVs, regardless of manufacturer, but the final configuration is TBD*).

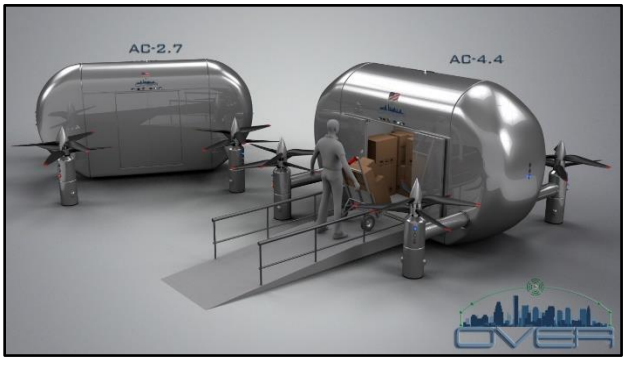
In order to accommodate the AV Assembly, all AVs must have an unobstructed bottom surface that is 6" above the landing surface and contain the AV Assembly, if they are to use the AVAAPS, regardless of manufacturer. However, it's not necessary for other AVs to contain the AV Assembly or use the AVAAPS at all. These AVs would simply have to have *more than 6" of ground clearance* so they can land over a Pad Assembly without touching it, or just land on helipads alone.

The AVAAPS is a multi-use product, suitable for government/military, commercial, and private applications. The primary market for the AV Assembly will be VTOL AV manufacturers who produce standard size AVs that would use the AVAAPS. OVER LLC would manufacture and sell AV Assemblies to AV manufactures directly, and/or sell licenses to manufactures so they can manufacture the AV Assembly themselves, for their particular AVs. The Pad Assembly portion of the technology would be manufactured by OVER and sold to the proposed Joint Venture LLC (JVLLC) and/or manufactured by the JVLLC under license (*see Chapter 7, the JVLLC Business Approach on our website www.OVER-LLC.com*). The Pad Assembly would be installed in all

covered parking garages during construction. The projected future market sales for the AVAAPS is in the *millions*!

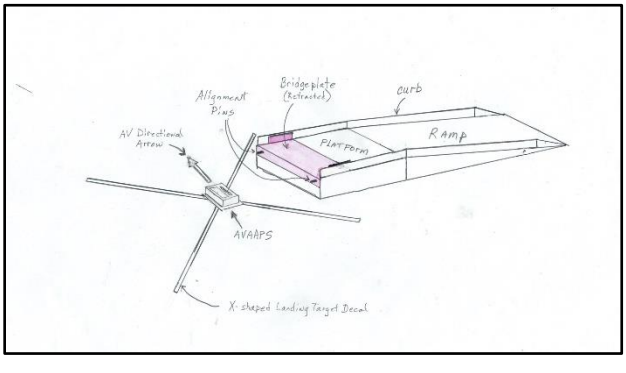
Ramp, Platform and Bridgeplate System (RPBS)

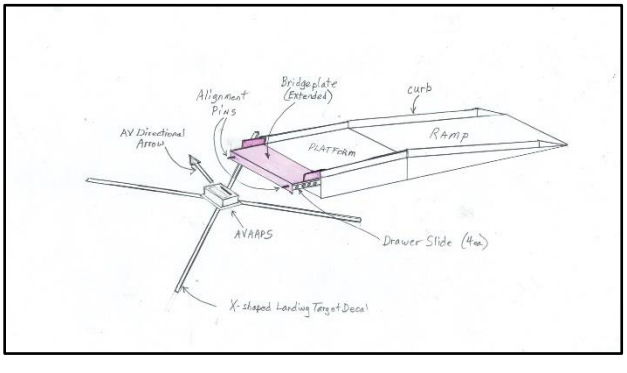
To facilitate level entry/exit into and out of select AVs (such as OVER's concept cargo and passenger AVs visualized below), we designed and propose the use of OVER's Ramp, Platform and Bridgeplate System (RPBS). At least one RPBS would be installed at each parking structure providing level entry/exit capabilities. A typical steel ramp is 4' wide x 9' long, and slopes upward to a 4' x 4' steel platform which is ~9" above the parking surface. These dimensions provide a 1:12 slope, which complies with the Americans with Disabilities Act (ADA).



The illustrations show handrails on either side of the ramp, which is *incorrect*. Handrails would *not* be used on ramps due to close proximity to propeller blades. However, ramps will have "curbs" at least 2" high on either side (see illustrations below), to prevent people or cargo from rolling or falling off the side. The ramp provides safe, convenient access for customers with wheelchairs, strollers, walkers, luggage, and various rolling cargo devices and containers.

Each RPBS has a steel "bridgeplate" measuring 4' wide x 2' deep x ¼" thick, as illustrated in the color RED below. The bridgeplate will autonomously extend and span the gap to/from an AV upon arrival, and autonomously retract just prior to departure. It is pushed out and pulled back by a single actuator installed within the platform. The actuator is powered and controlled by +12VDC or -12VDC, supplied by the Pad Assembly. The bridgeplate is supported by four heavy-duty, ball-bearing type, steel drawer slides capable of supporting about 900 kg (~2,000 lbs.) total.





Arrival Procedure: When the Pad Assembly receives the wireless "ANCHOR" signal from the AV, its control circuitry sends a +12VDC signal via the STP cable to the RPBS's actuator, to extend the bridgeplate. Once received, the +12VDC moves the actuator outward, to *extend* the bridgeplate until rubber bumpers contact the AV, at which time it stops. While extending, two alignment pins

on the bridgeplate slide into two tapered holes below the AV doors, to properly align the bridgeplate to the proper height/position. After the bridgeplate is in place, the AV doors will open without dragging on or touching the bridgeplate.

Departure Procedure: After loading and the doors close, the AV transmits the wireless "UN-ANCHOR" signal to the Pad Assembly, which then sends -12VDC via the STP cable to the RPBS's actuator. Once received, the -12VDC moves the actuator backwards, to *retract* the bridgeplate. When the bridgeplate is retracted and the AV un-anchored, the AV can depart.

Other manufacture's AVs would have to contain the same size/position tapered holes as the OVER AVs for bridgeplate alignment – if they are to use the RPBS. However, it's not necessary for other manufacturers to use the RPBS at all, or have level entry/exit. These AVs would just land at parking garages or helipads without the RPBS, and their customers would simply step in/out.

The RPBS's bridgeplate, slides, controller and actuator would be pre-assembled within each platform, in the manufacturing plant, and then installed when the AV parking garage is established.

In OVER's opinion, the *AVAAPS will be essential* to providing safe, efficient and reliable autonomous VTOL AV parking, anchoring, powering, loading and unloading within a future, national, standardized, networked ATS. The *RPBS will also be essential* to providing level entry/exit which enables mobility for all, as well as efficient loading/unloading of rolling cargo dollies, bins, and other containers. Both systems will accommodate a variety of VTOL AVs, regardless of manufacturer. Therefore, we are seeking to obtain U.S. government approval and industry acceptance/endorsements of the AVAAPS and PRBS technologies. We are also seeking to eventually establish both the AVAAPS and RPBS technologies as U.S. and international standards for fully autonomous VTOL AV parking, anchoring, powering, loading and unloading.