CASE STUDY

SkyX xStation:
Remote Controlled Drone Garage

“A production ready custom garage was designed, built and operating - in 7 months!"

This rugged, weatherproof Command Center is a ‘Drone Recharging Garage’ managed by a remote operations center. These garages are a climate-controlled series of landing stations in the wilderness. SkyX introduces the xStation designed to recharge and protect SkyX's Unmanned Aerial Vehicle (UAV) on its long distance sorties.

The UAV drone is an autonomous hybrid aircraft with ~2m wingspan. Like the Garage, the UAV is remotely controlled and launches vertically before leveling out into fixed-wing flight with a range of 100km (62 miles) for remote aerial monitoring of long-range infrastructure assets

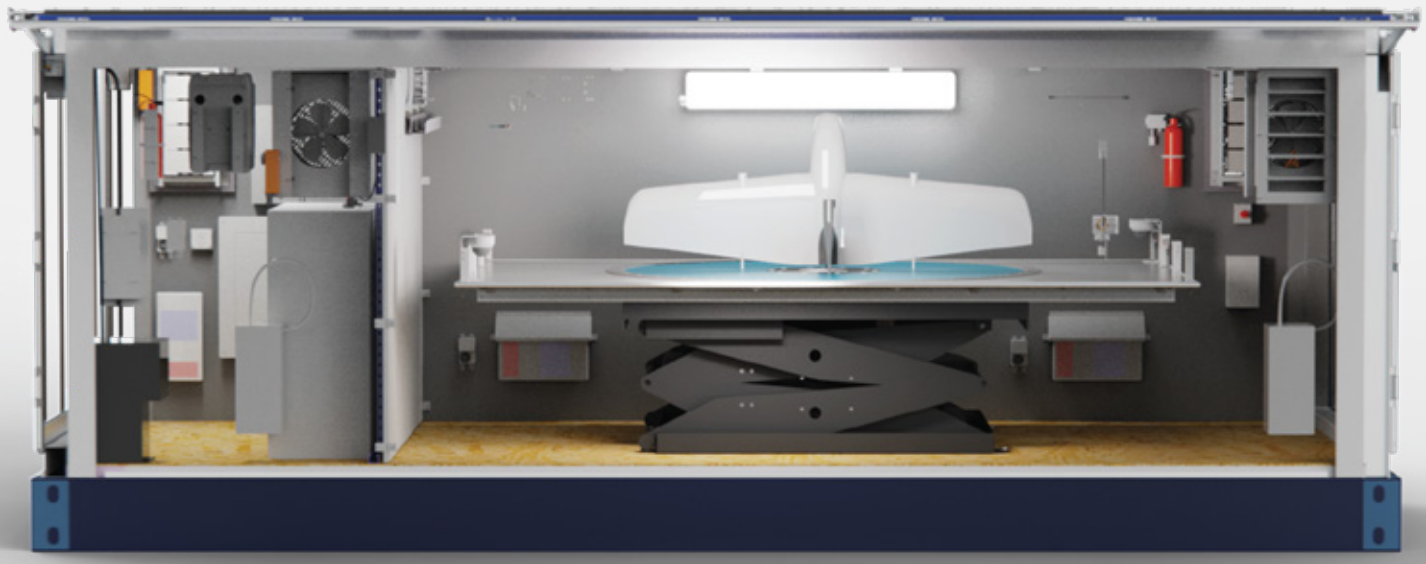
The Challenge:

SkyX came to Design 1st with a new custom solution that cost 2.5X the initial target cost required to produce the product in volume. The Design 1st team was tasked with re-designing a lower cost version of the original solution. Design requirements were to maintain the actuated roof that would allow safely landing, recharging, and housing of SkyX's Unmanned Aerial Vehicle (UAV) used to conduct remote aerial monitoring of long-range infrastructure assets.The station requires power and is put in place outdoors, anywhere in the world and under the harshest weather environments

The project encompassed not only preserving the features of the original design, but also ensuring a simple manufacturing process and confidence in supply chain component availability over the product sales and maintenance lifetime. Added to this, the Design 1st team would need to reduce the overall build, shipping and maintenance costs by more than 50%. The entire project must meet an aggressive 7-month delivery of a working product prototype that was an investor demonstration requirement timeline.

The Solution:

The need for a low-cost rugged outdoor room led the design team to a custom shipping container as it was structurally sound, 100% waterproof and could withstand large fluctuations in outdoor temperatures. The roof of the container would need to open to the skies. Internally the design incorporated a 2.5m x 4m dual-axis Gantry that could safely raise and lower to land, secure, transport and charge the aerial UAV. A customized off the shelf hydraulic roof opening system, lift and rotation system, and programmable logic controller (PLC) were employed to deliver a safe haven for charging the UAVs that came and went on their travels along a pipeline, power line or railway.



Impact on Client:

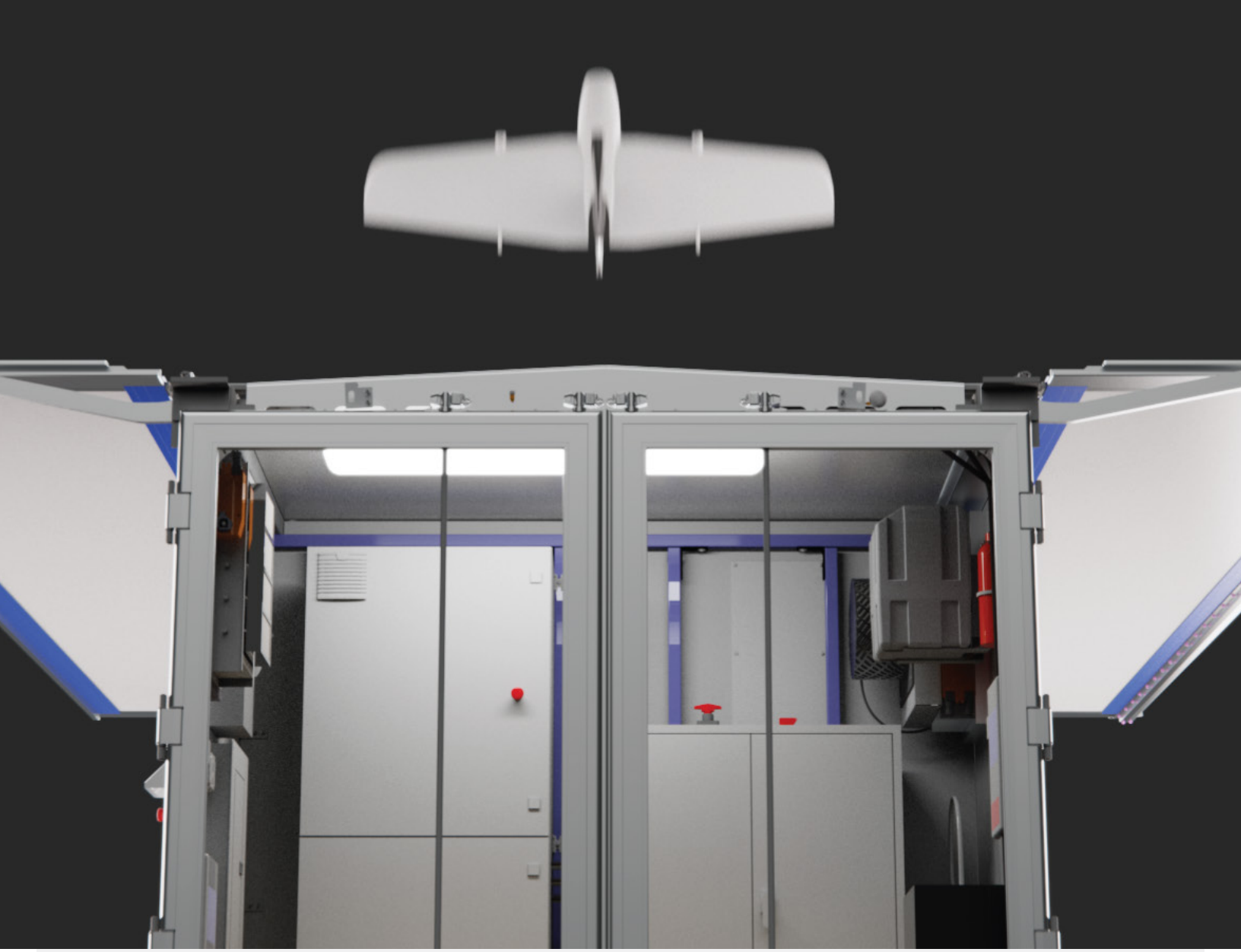
Successful development of a custom, climate-controlled weatherproof (+40 C – 40 C) ‘Recharge Station’ using transportable shipping containers to protect, charge and maintain a UAV for remote aerial monitoring of long-range infrastructure assets. Successful scalable volume production solution with a manufacturing ready design. The project was completed under budget and within the 7-month delivery timeframe.

Design Project Overview

Toronto-based SkyX is a leader in aerial intelligence that collects aerial data using autonomous long-range UAVs and turns that data into meaningful, actionable insights using its SkyVision software. The company is revolutionizing the way aerial data is accumulated, analyzed and actioned. SkyX customers select the company's innovative solutions to better inspect and monitor their assets, so they can better identify and remediate asset integrity issues and external threats.

In 2017, SkyX selected Design 1st to design a custom aerial UAV shipping container that is ruggedized, weatherproof, delivering a prototype that could be constructed within a specified timeline and budget. The company had previously worked with another design team to develop a custom three-piece metal container that not only proved heavy and difficult to build and transport with chain-driven motor systems, but well exceeded product cost targets. SkyX was particularly impressed with Design 1st 's mechanical design, electronics, and manufacturing expertise all integrated in one group. The Design 1st team developed a custom modular, shipping container that met their existing needs and was developed under budget.

The Design 1st team conducts early risk and cost assessment as a core part of their development process. By leveraging their supplier and manufacturing network, Design 1st was able to successfully select and customize an off-the-shelf enclosure that incorporated a hydraulic roof system. The team also selected and customized an off-the-shelf Gantry (double-axis machine) that was low cost, compact and traveled smoothly meeting the system requirements. Customizing off-the-shelf subsystem components only when necessary and kept the project within budget and timeline while ensuring the highest quality of product was produced.



Reducing Risk & Cost:

The Design 1st team addressed costs, part design and supply risks up front, including analysis of risks associated with sourcing components when producing in both small and larger volume. The team also sourced as many off-the-shelf components as possible, including a dual-axis robotic Gantry system that was customized for container fit and a specialized a European designed container with retractable roof system. The component subsystem selection and early cost analysis resulted in 2.5X reduction in the cost of final product design, exceeding the original cost targets.

From the Client:

“The Design 1st team exceeded our expectations from a custom product design standpoint. As a startup we were working within a budget but expected the highest quality product. Design 1st identified the risks up front, had the vast network of partners to find workarounds for the right components and customized it to meet our unique needs. The team helped us deliver an exceptional product to market.”

- Didi Horn, Founder & CEO at SkyX

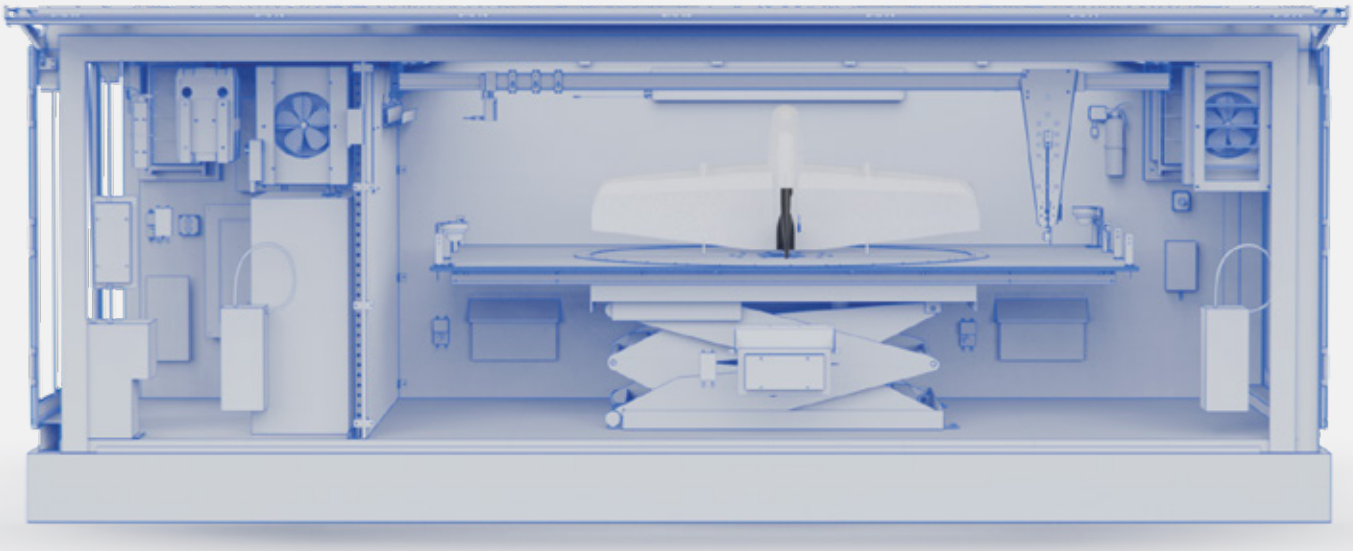
“We didn’t look at this shipping container project as ‘one and done.’ We wanted a product that could be replicated for scale and the Design 1st team has enabled us to do just. Their team’s forward-thinking approach complemented ours and this partnership resulted in a customized container that protects, charges and transports our aerial vehicles virtually anywhere around the world.” Added Horn.

Manufacturer & Supplier Selection

The Design 1st manufacturing set-up team leveraged their network of global partners and customized off-the-shelf components to meet project budget and timeline requirements. The toughest challenge was sourcing the world's only existing 'articulated' weatherproof modular shipping container from a company in Austria that features a clamshell-style roof design for remote controlled opening and closure. The Design 1st team also set up the onshore manufacturing plan including transitioning production drawings, final 3D CAD models, bill of materials and supplier contracts to SkyX. All of this contributed to ensuring the product design and the set up for manufacturing built in the acceptance reliability and met budget requirements.

Fast Turnaround

The Design 1st team ordered and customized the shipping container and integrated the sub-systems in-house and successfully delivered a fast-paced development process to meet investor targets building a fully functional production prototype. The team also designed, fabricated and tested over 150 custom mechanical parts, over 350 electronics components and sensors, and managed the supply chain interactions to get the prototype ready for demonstrations – all within seven months.



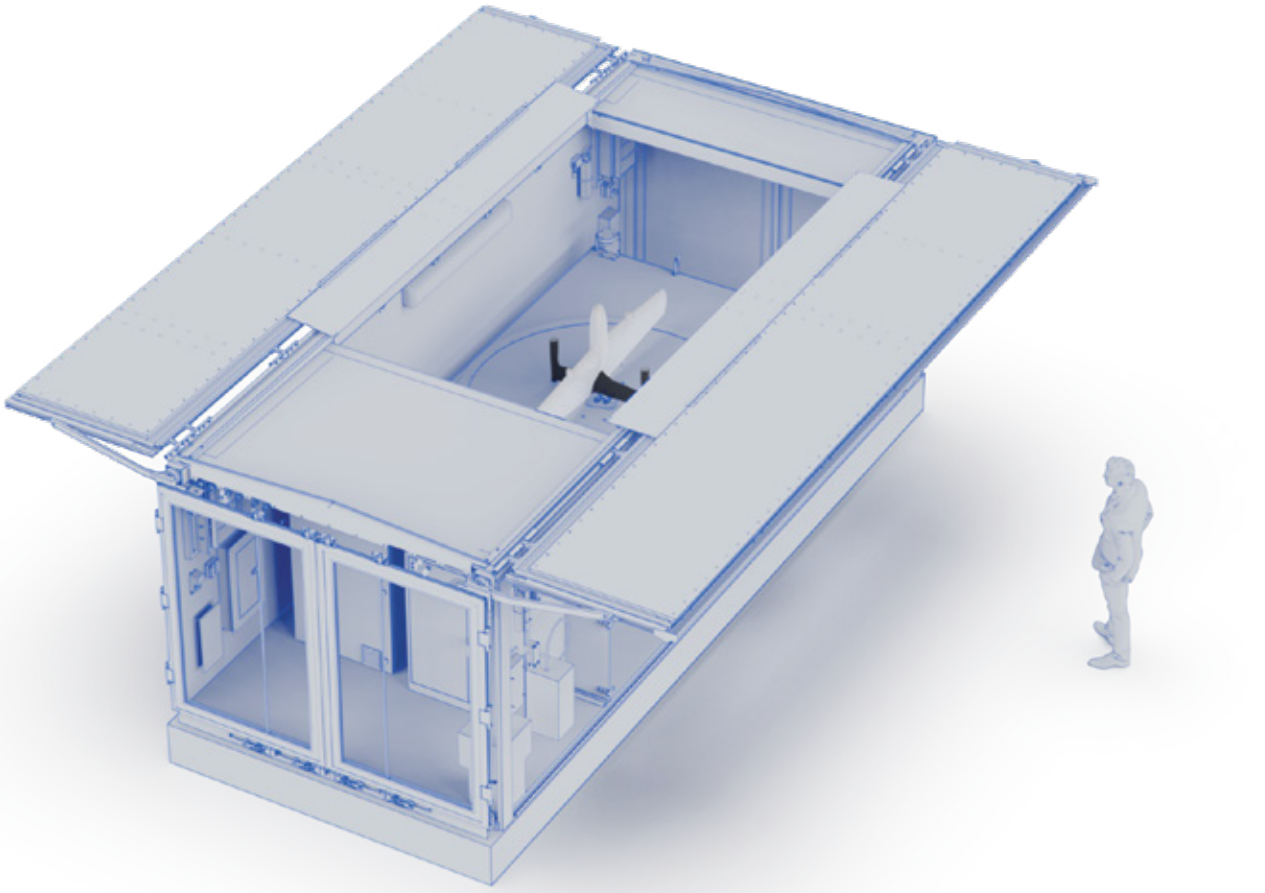
Detailed Engineering:

- Thermal and HVAC Finite Element computer simulations of the product concept

- Container design modifications done in 3D CAD including drill plans, hinge installation, rubber overhang sealing sections, routing of HVAC, cable and drainage holes

- Design customization to define framing, floor, insulation of enclosure for low temperature and custom monoplan landing platform and roof sections designed in 3D CAD computer geometry

- Creation of BOM (Bill of materials) including all components of the product and sub-systems to track suppliers and monitor the cost of product throughout the design process



Prototype & Testing:

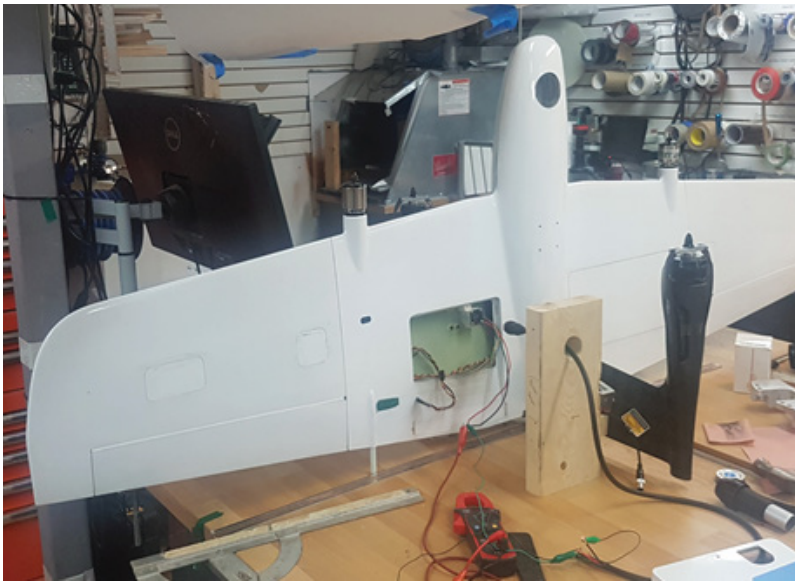
- Delivery of container to Design 1st on 18-wheel flatbed truck, hire crane operator to put in place at Design 1st offices

- Conducted round-the-clock rapid tests during fall and winter months to ensure doors were leak-proof and inside temperatures were acceptable during the harsh freeze thaw and -30C winter weather conditions

- Container modifications for battery, sensors, HVAC, gantry installation and framing of floor including insultation

- Test remote electronics connections with SKY-X team

- Update 3D CAD model with modifications of container following prototype build



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