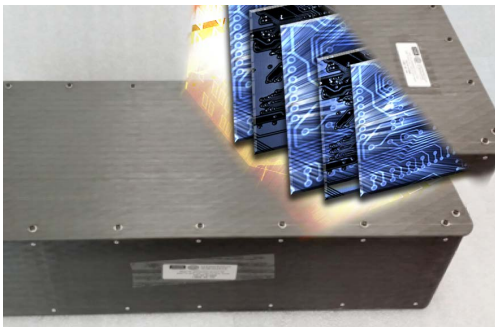
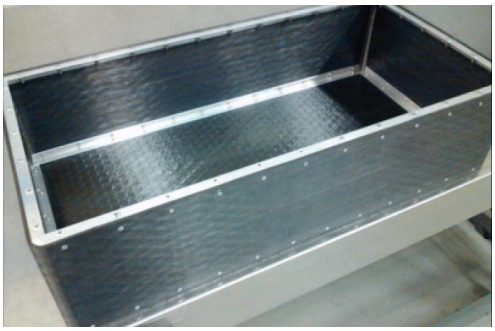
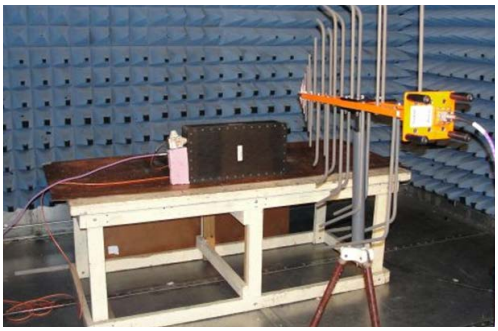
SURVICE ENGINEERING COMPANY

# COMPOSITE ELECTRONICS ENCLOSURE







## BACKGROUND

Harmful electromagnetic (EM) effects to onboard electrical/electronic systems for both air and ground vehicles can be critical, especially for those systems that affect the safe operation of the vehicle or that are critical to mission performance. EM environments—such as high-power radio frequency (HPRF), high-power microwave (HPM), lightning, and electromagnetic pulse (EMP) environments—can produce upsets and hard faults, resulting in permanent and sometimes catastrophic damage to circuits, subsystems, and ultimately the platform.

To mitigate these effects, sensitive electronics are often placed within a metal enclosure, which acts as a "faraday cage." These enclosures isolate internal emissions and protect electronics from external emissions. Unfortunately, these enclosures and support structures can often be heavy and "costly" in terms of the aircraft's overall weight constraints. Thus, what is needed is a lighter enclosure that can equal the protection and durability of the metal enclosures.

## SURVICE'S COMPOSITE ENCLOSURE SOLUTION

Leveraging the strength-to-weight advantages of composite materials and unique manufacturing processes, the SURVICE Engineering Company and its manufacturing partner Automated Dynamics Corporation (ADC) have developed a composite electronics enclosure that equals the shielding protection and durability of current metallic enclosures. This solution results in significantly less weight and uses an automated process to yield affordable fabrication costs.

Specifically, the SURVICE-developed enclosure features:

- A >70% weight reduction over traditional metallic enclosures (such as aluminum).
- Equivalent structural/operational characteristics as a metallic enclosure, including excellent durability and tailorable thermal conductivity.
- Sufficient shielding effectiveness to support all applicable MIL-STD-461, -464, and -2169B requirements.
- Resistance to chemicals/fluids (air and ground), CBRN effects, and decontamination exposure.
- Producibility and scalability to large and small enclosures using a fabrication methodology that is compatible to standard manufacturing processes.
- Compatibility with highly automated manufacturing and assembly processes.
- Ability to be tailored to individual requirements.
- Continuous metallic bond for gaskets and connectors, achievable due to copper mesh layers.

## ENCLOSURE DESIGN AND SPECIFICATIONS

SURVICE's composite enclosure design consists of a main body that is connected to a top and a lower lid using angle strips. The body and lids are manufactured using an in-situ tape placement fabrication process. The lids can be easily removed from the enclosure to accommodate and access interior electronics.

continued...



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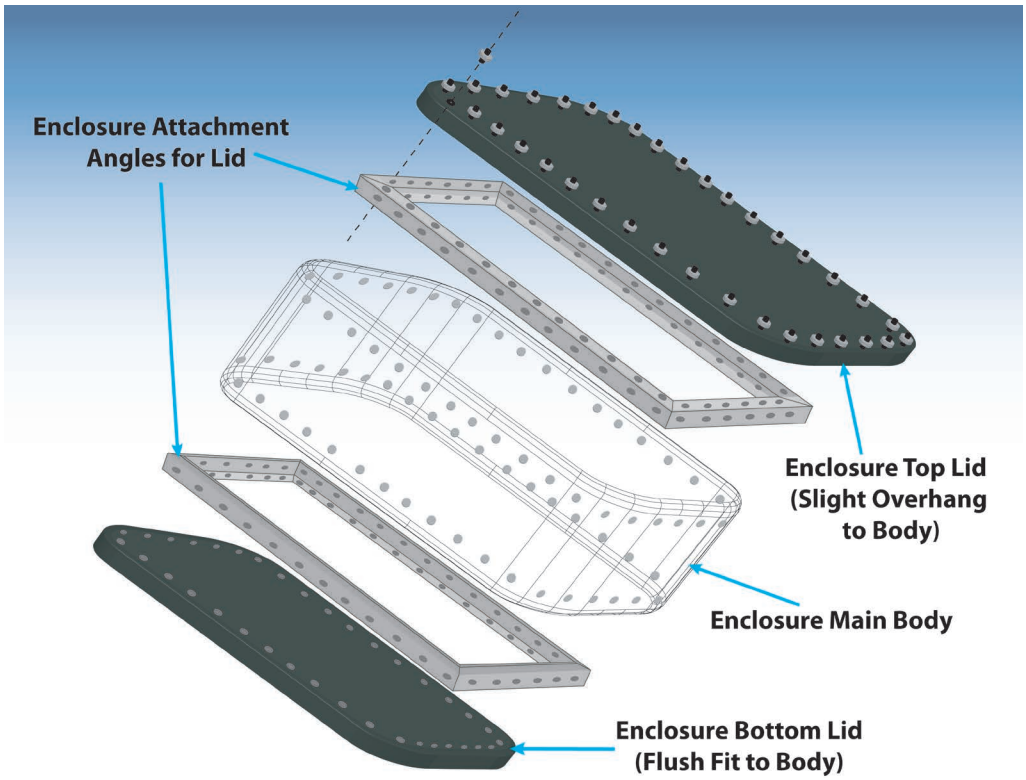


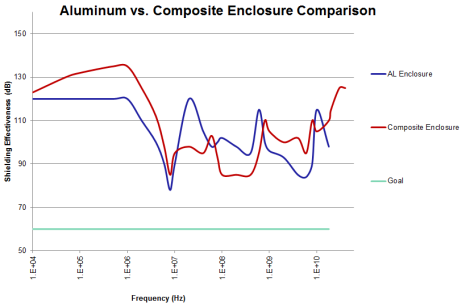


The weight of the completed composite enclosure is significantly lower than that of a comparable aluminum enclosure. (For example, the sample enclosure pictured weighs 7.6 lbs, compared to 32.5 lbs for the aluminum baseline enclosure.)

Due to the significant weight reduction of the composite enclosure, the handling characteristics are also significantly reduced over those of traditional metal enclosures. The use of a thermoplastic system provides a level of damage tolerance that exceeds that of traditional epoxy-based composites and is a suitable replacement for a metallic structure. In addition, demonstrated environmental and fluid resistance supports the composite enclosure's application in all environments (ground, air, sea).

## AND THE RESULTS ARE IN

EM shielding effectiveness testing was conducted on the SURVICE-developed composite enclosure at the National Technical Systems (NTS) (formerly Wyle Laboratories) in 2014. For this testing, the enclosure was completely sealed, with the exception of provisions for the antenna and cable. A subminiature version A (SMA) connector was mounted on the side of the enclosure box, which allowed an RF tight connection for the coaxial cables between the antenna inside the enclosure and receiving equipment outside the enclosure.

When compared to the test results for an aluminum enclosure of the same shape and size (as well as a baseline shielding effectiveness of 60 dB against all frequencies), the composite enclosure test results clearly demonstrated that the shielding effectiveness of the composite enclosure, although much lighter than the aluminum baseline version, provides equivalent EM protection.

In addition, due to the material and process used in composite manufacturing, developers recognize the potential to tailor the shielding effectiveness of the composite enclosure to develop a balance between weight, structural capability, and shielding.

**SBIR DATA RIGHTS**
Contract No. FA8650-13-M-5041
SURVICE Engineering Company, LLC
4695 Millennium Drive, Belcamp, MD 21017
Expiration of SBIR Data Rights Period:
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**PATENT PENDING**



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