

## Cryogenic Rated Composite Material Significantly Improves Functionality of Liquid Air Life Support System

The National Aeronautics and Space Administration (NASA) has been developing the next generation of life support systems in conjunction with CryoLife Support Systems (CLSS) in Titusville, FL. This improved design by CLSS features a novel pickup of the liquid air that allows air to be supplied even when the pack is 90° off vertical. This feature greatly increases the safety and functionality of this system for terrestrial applications such as firefighting and other first responders.

### Problem & Solution

CLSS approached Norplex-Micarta to address issues with excessive heat leakage into the cryogenic liquid air from several metal components. While CLSS has many options for insulation systems, the materials available that had the mechanical strength required, and a low thermal conductivity were limited.

Norplex-Micarta proposed two materials, NP500CR and RT521M for this application. These materials have been proven in cryogenic applications in space, oil and gas, laboratory, and processing industries for several decades. Adapting them to this environment required overcoming some size limitations and supporting the design work with detailed mechanical and thermal data at cryogenic temperatures.

### Validation Process

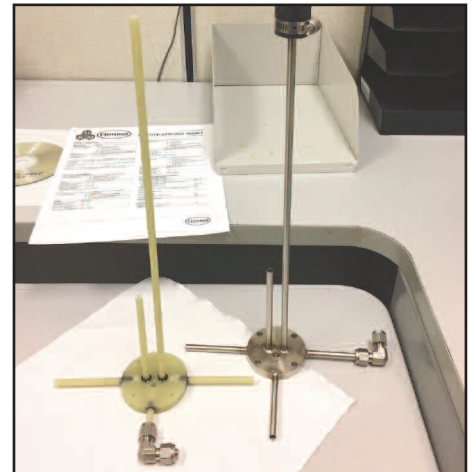
While the final configuration and approval of this improved device is ongoing, initial testing shows that frost only formed at the areas of active flow, while the remainder of the flange was at ambient. In addition, preliminary test results indicate that the boiloff rate has been reduced by roughly 50% – exactly the result that was expected and confirmation of good thermal properties.

**“The Norplex-Micarta materials performed very well, reducing our heat leakage by about 50%. In addition, the material was much easier to work with than Stainless Steel allowing us to manufacture parts in-house with common tooling. This solution will significantly reduce the heat leakage into our packs. This will keep the pressures lower in the pack, increasing standby time, and reducing boil off losses, which ultimately increases the time a user has in the hostile environment.”**

– David Bush, Engineer,  
NASA Kennedy Space Center.



Firefighters testing liquid air pack vs. standard SCBA - Photo courtesy of CLSS



Original steel design with prototype composite design - Photo courtesy of NASA



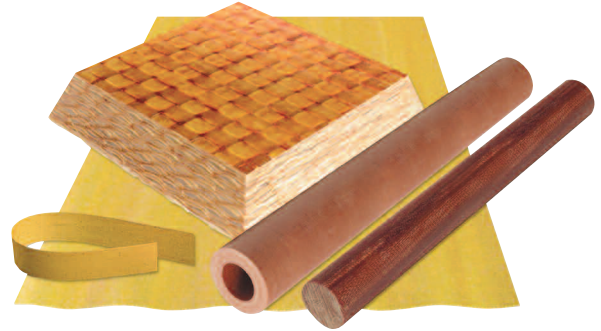
Steel assembly in test

Composite assembly in test

- Photos courtesy of NASA

## Innovation backed by over 100 years of experience

Norplex-Micarta produces thermoset composite pre-pregs, sheets, and shapes from facilities in North America and China. Utilizing several different resin systems on nearly limitless different reinforcements, we offer to industry unrivaled repeatability, scalability, and affordability. From demanding high voltage equipment, to the cold of space, to the pressure of oil and gas exploration in the depths of the earth and nearly everywhere in between, thermoset composites can be engineered to your specific requirements.



### pre-pregs

Pre-pregs have the greatest strength to weight ratio of any composite material. Norplex-Micarta produces pre-preg in a solution coating process. Compared with other pre-preg manufacturing techniques, this method assures even resin impregnation, fast production speeds, and normally results in a tack free pre-preg that is well suited for high volume, automated, fabrication.

### sheets

Manufactured from Norplex-Micarta's pre-pregs, sheet products provide unique advantages to designers of composite parts and structures. They are readily available for fabrication into parts by standard machining processes, available in high volumes, and easily customized with different surface or core materials, including traditional materials like rubber or metals.

### shapes

Also manufactured from Norplex-Micarta's pre-pregs, stock shapes are readily available. These include tubes, rods, springs, and other geometries. Like flat sheet materials, these stock shapes can be fabricated easily, and can be customized to meet the requirements of a specific application.

## Norplex-Micarta's standard materials provide a baseline for design and development work

Designing a composite part is in some ways a designer's dream, with nearly infinite combinations of materials that can be utilized to achieve specific design goals. This flexibility also presents a challenge—specifically, how to choose the inputs and build the composite most suitable for an application? Norplex-Micarta's approach is to partner with and assist designers in this process. Our team of applications engineers work with designers to narrow the range of options, and help to develop datasets, models, and/or prototypes that allow for quick initial evaluation. If a standard material isn't the solution, we then work collaboratively with designers on their specific application.

**Contact Norplex-Micarta today to learn more about how our thermoset composites can help you achieve your design and development goals!**

665 Lybrand Street | PO Box 977 | Postville, Iowa 52162 | P: +1.563.864.7328