RAPID™ composites

Advanced Composite Solutions... FAST

Bullray™ AMPHIBIOUS VTOL UAS - Design to Production

Phase I - Industrial Design

Phase II - Engineering

Phase III - Prototyping

Phase IV - CNC Tooling

Phase V - Molded and Untrimmed

Phase VI- Trimmed and Painted

Phase VII Final Assembly

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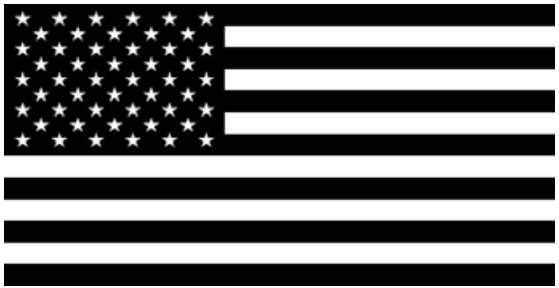


Rapid Composites is a
Proud U.S. Based Supplier

IN HOUSE CAPABILITIES

Since 1999 **Rapid Composites** has been an established provider of engineering services with the skill, training, expertise and resources to take projects from concept through production. We work on time, on budget and within the most exacting standards of precision and performance.
Rapid Composites offers a wide array of services including industrial design, mechanical engineering, electrical engineering, software engineering, prototyping, tooling, carbon fiber molding and production. We specialize in developing products from the ground up and are capable of executing a “start to finish” process entirely under one roof.

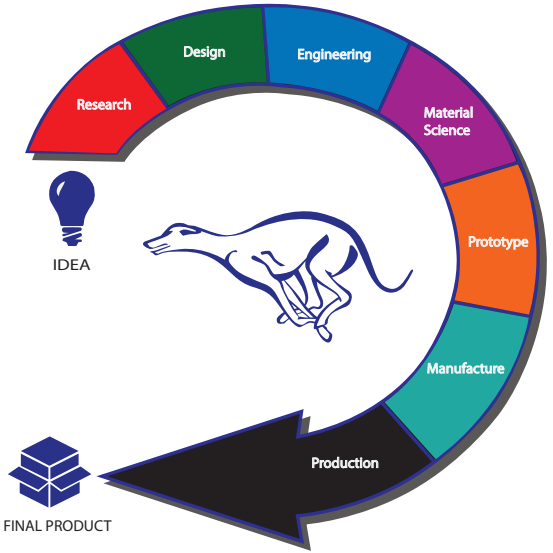
Composite POD

PROJECT MANAGEMENT

Our Project Managers work with our clients to:

- Define the scope of the project
- Create a project budget
- Prepare detailed schedules and task lists

This process allows us to manage our resources, ensuring that the project is completed within the defined scope, quality, time and cost constraints.



We have the ability to go from napkin sketch to full production under one roof

INDUSTRIAL DESIGN

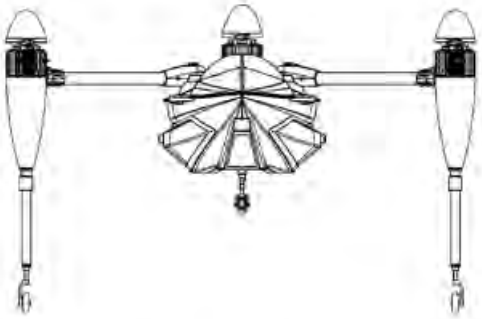
Our team of designers will bring your product to life utilizing rapid sketching and computer modeling. We will illustrate various alternatives that can then be evaluated for aesthetics, functionality and ergonomics.

After choosing a concept our designers begin refining its details within PTC Creo and rendering utilizing 3ds Max or KeyShot. Still images and animations are often provided to give a realistic and accurate depiction of the product in its target environment. Full motion video of the concept is available upon request.

ENGINEERING

Our ability to solve difficult challenges is in our DNA and is the driving force behind what makes up our diverse team of inventors, designers and engineers. Our comprehensive engineering capability ensures Rapid Composites can bring almost any product to fruition and entirely under one roof.

MECHANICAL ENGINEERING



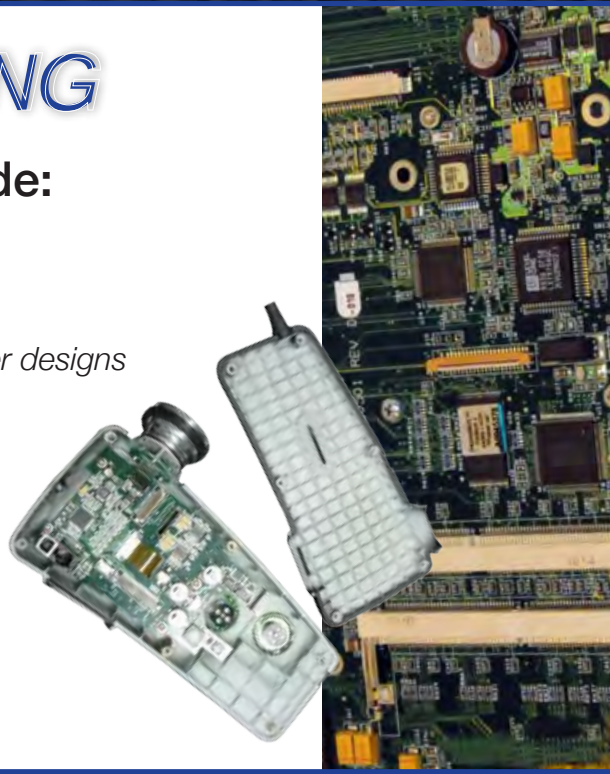
Bullray™ Amphibious VTOL UAS

Our highly trained staff of mechanical engineers has extensive experience working with PTC Creo and Solidworks 3-D modeling software. At Rapid Composites there are no walls within our design/engineering studio in order to facilitate a collaborative environment. This enables our team to take the product from concept to production in a synchronized effort.

ELECTRICAL ENGINEERING

Our electrical engineering capabilities include:

- *System architecture for embedded systems*
- *Schematic capture*
- *PCB layout and routing to include, high speed digital and multi-layer designs*
- *Testing and debugging*
- *Micro-controller firmware*
- *CPLA/FPGA programming*
- *Power supply design*
- *Membrane keypad design*
- *Operating system configuration and integration*
- *Support for Windows XP Embedded, Windows CE and others*
- *PLC system development and programming*



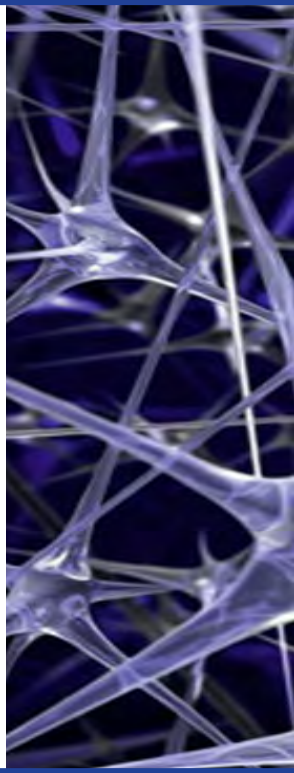
SOFTWARE ENGINEERING

In addition to our electrical engineering capabilities, we also boast the ability to work with embedded programming for micro-controllers and PC BIOS customization. We develop utility applications for Windows based systems. Languages utilized include, Assembler, C, C++, C#, and Visual Basic.

MATERIAL SCIENCE

We have materials that are up to two times more thermally and electrically conductive than copper. Conversely, we also work with dielectric and radiolucent materials. There are thousands of options and combinations available.

Automated molds are made from aluminum or steel depending primarily on processing temperature requirements. Aluminum and steel have shot lives of 5,000 and 50,000, respectively. These molds often cost 60% to 70% less than conventional processes like injection molding or die-casting.



Areas of Focus:

- *Thermoplastic Composites*
- *EMI/RFI Sheilding*
- *Thermally Conductive Materials*
- *Non-Conductive Materials*
- *Rapid Cure Composites*
- *Compounding/Hybridization*
- *Continuous Fiber Molding*

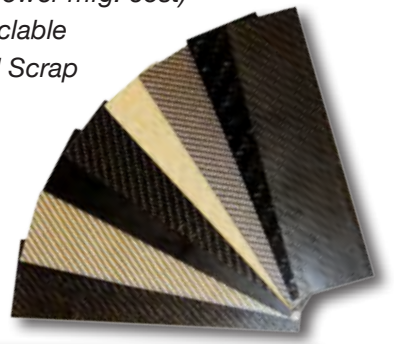
THERMOPLASTIC COMPOSITES

Compared to Metals:

- *High Strength/Stiffness, Toughness*
- *Reduced Weight*
- *Low Coefficient of Thermal Expansion (CTE)*
- *Inherent Corrosion and Chemical Resistance*
- *Increased Part Function via Part Consolidation*
- *Reduced Secondary Operations*
- *Styling Freedom/Contoured Shapes*
- *Inexpensive Tooling*

Compared to Thermoset Composites:

- *No Need For Controlled Storage/Unlimited Shelf Life*
- *Significantly Faster Cycle Times (lower mfg. cost)*
- *Environmentally Sound and Recyclable*
- *Can be Re-processed – Reduced Scrap*
- *Superior Toughness*



Standard Polymers: TPU • PC • PET • PET-G • PA-11, 12, 6, 6/6 • PBT • PPS • PEI • PEEK • PEK • LCP

EMI/RFI SHIELDING

Rapid Composites can incorporate precision-expanded metals and foils to meet your exact requirements for shielding, electrical conductivity and thermal transfer properties. Our in-situ laminated shielding materials can be incorporated into the thermoplastic matrix, providing superior performance that does not flake off with time. This is an effective shield against EMI/RFI emissions. Formed from sheet metal, the shape, pattern and open areas are engineered to match the needs of your particular application. More than 35 different metals can be custom expanded to shield against specific wavelength spectrums. They can even be laminated, coated and plated. We offer some of the only composite structures capable of being soldered.

Our experience further extends into co-laminated, dielectrically insulated foils and flexible PCBs acting as conductive traces, thereby, eliminating point-to-point wiring connections. These materials wrap and conform to almost any shape. Designers are free to be creative with complex surfaced geometry.

Notable Advantages:

- *High Electrical Conductivity*
- *High Thermal Conductivity*

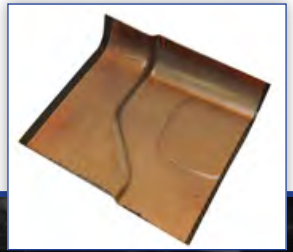
Expanded metal options that can be co-molded into our composite materials include the following:

Al 1145	Copper	Ni 201	SS 304L
Al 3003	Gold	Nickel	SS 316L
Al 1100	Hastiloy X	Ni 899L	SS 444
Brass 260	Haynes 214	Niobium	Steel 1008
Brass 70-30	Inconell 600	Palladium	Tantalum
Brass 80-20	Iron	Platinum	Titanium
Brass 85-15	Lead	Platinum Clad Niobium	Zinc 500
Bronze 90	Magnesium	Silver	Zirconium
Cadmium	Molybdenum		

EMI/RFI Shielding Examples

Expanded Metal Fabric

CF with Copper Foil



CF with Copper Expanded Metal

CF with Nickel Plated Glass Fiber

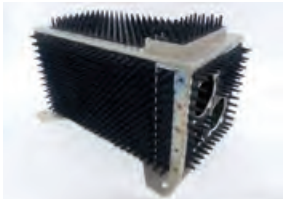
THERMALLY CONDUCTIVE MATERIALS

Rapid Composites has the ability to design, tool, mold and safely post-process machine advanced thermally conductive components for a wide range of industries. Our battle proven solutions operate in the most extreme environments.

We have years of experience working with thermally conductive PITCH-based crystalline carbon fabrics, braids, chops and milled fibers. These materials are produced in a wide range of styles and are even available in unidirectional, biaxial and tri-axial forms. PITCH fabrics can be processed into composites for a variety of thermal and CTE-critical applications that require exceptional fatigue and frictional properties. These materials can be infiltrated with metals or polymers for optimized thermal and mechanical properties.

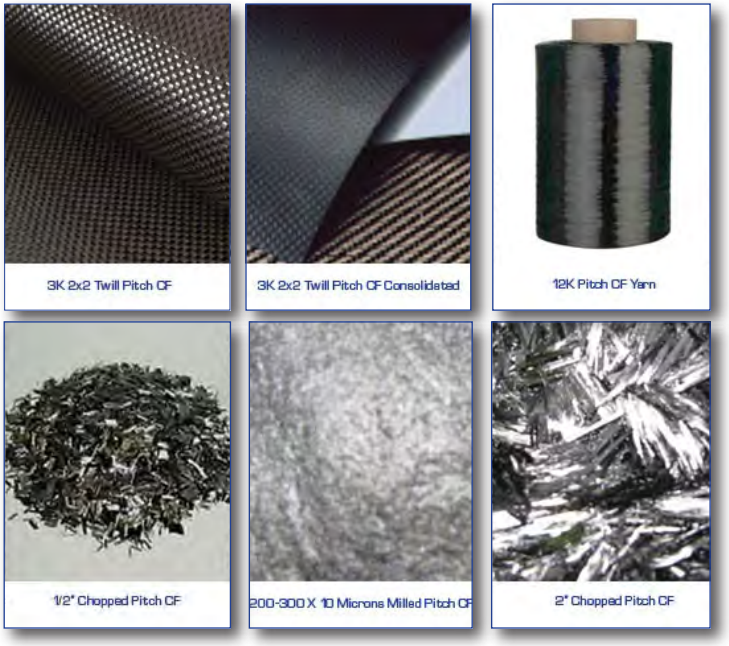
PITCH Fiber/Aluminum and Copper Heat Sinks

Pin Fin Enclosures



Pin Fin and Aerodynamic Blade Fin PITCH Fiber Heat Sinks

Thermally Conductive Examples

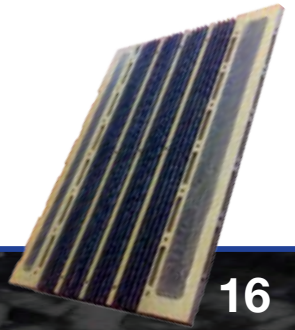


Thermally conductive discontinuous fibers are available in a free-flowing form that can be easily blended and compounded with most other materials. Many of the materials utilized have a longitudinal thermal conductivity more than two times higher than copper at 900 W/mK, and a tensile modulus greater than 120 Msi. Chopped fibers are also available in 1/2” to 4" lengths with a thermal conductivity of 350 W/mK to 900 W/mK varying by grade. These materials can also be mixed as slurry with fibers isotropically oriented ensuring that conductivity will be equal in any direction.

Notable Advantages:

- *Zero CTE*
- *High Thermal Conductivity*
- *High Electrical Conductivity*
- *Excellent Impact Resistance*

Bonded Fin PITCH Fiber Heat Sink



NON-CONDUCTIVE MATERIALS

A great deal of emphasis is put on increasing the thermal and electrical conductivity while reducing weight. Conversely, we are often asked to design components that require dielectric or radiolucent properties. There are many suitable thermoplastic and thermoset composite materials available in both continuous and chopped fiber.

We routinely utilize e-glass materials for radome and antenna applications. Phenolic-based composites are often used for radiolucent applications. Many of the fabrics and chopped fiber can be molded with PPS or PEEK to provide superior temperature resistance and increased impact strength.

Notable Advantages:

- *Low CTE*
- *Low Dielectric Constants of 2.5 or less can be achieved*
- *Thermal Insulating Properties*
- *Excellent Impact Resistance*

Non-Conductive Material Examples

E, D, R and S-Glass
Thermoplastic and
Thermoset Fabrics

Kevlar/PA-12
Thermoplastic Fabric

E-Glass/PP
Uni-Directional Tape

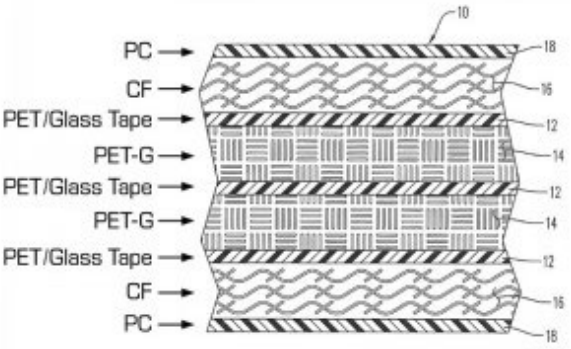
E-Glass/PA-6
Molded Example

COMPOUNDING AND HYBRIDIZATION

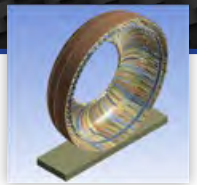
Rapid Composites has the ability to combine materials in unique custom ways to meet the most challenging demands.

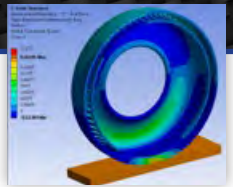
- *Polymerization Research*
- *Hybrid Development*
- *Compounding*
- *Consolidation*
- *Hydrocarbon Chain Modification*

Example of a Pre-Consolidated Hybrid Thermoplastic Composite Solution



TESTING





Non-Pneumatic Composite Tire

Mechanical

- FEA
- CFD
- Tensile
- Fatigue
- Compression testing
- Open hole tension and compression
- In-plane shear
- Inter-laminar shear
- Drop weight impacting
- Shake table testing

Environmental Tests

- Temperature/humidity conditioning
- Fluid immersion

Physical Tests

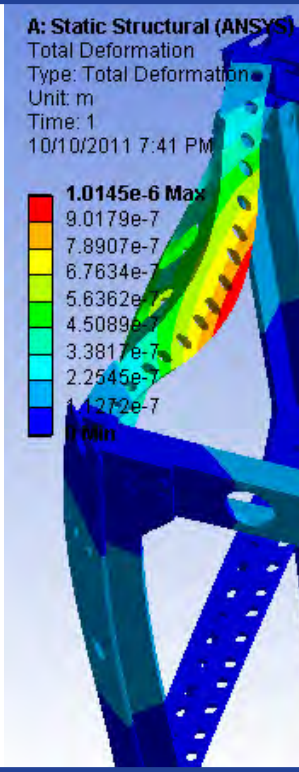
- Fiber Volume Fraction – Glass (Burn-off)
- Fiber Volume Fraction – Carbon (Acid Digestion)

Thermal Tests

- Glass Transition Temperature (Tg) by means of a Dynamic Mechanical Analyzer (DMA)

Certifications:

- UL, CE, NSF, FCC, IP, i-Safe, MIL-810, 461, 901D



RAPID PROTOTYPING

In order to ensure the functionality of a design prior to production, we provide our clients with high-quality prototypes. We use a combination of solutions to include, fused deposition modeling (FDM), selective laser sintering (SLS), stereolithography apparatus (SLA), RTV molding, CNC machining and many others.

Our designers and engineers work together to model, print, program, machine and assemble your prototype, all under one roof. Prototypes can be post-processed with Class-A surfaces, ultrasonically welded, epoxy bonded, painted, screen printed and even fiber reinforced to mimic a composite structure.

"Bullray" Amphibious Tri-copter UAS (Fiber reinforced FDM) - Sketch to Flying Prototype in 3 Months

Rapid Composites specializes in fabricating highly complex and precision rapid prototypes that can even fly! Our proprietary reinforcing techniques are second to none. Prototypes can be tested with actual hardware allowing us to identify problem areas before entering into tooling and production phases.

MANUFACTURING

Our ability to take your product from engineering to production allows us to effectively manage the schedule. Our engineers provide continuous oversight and guidance throughout all aspects of a production build, ensuring that any issues are resolved in the most expeditious way.

CNC MACHINING

We offer a full range of precision in-house machining to include:

- *Mold making*
- *Prototyping*
- *Short-run*
- *Production machining*

HAAS GR 510

X	Y	Z
120”	60”	24”

HAAS VF 8

X	Y	Z
64”	40”	30”

DMG MORI 2500 | 700

Max Turn Diameter **18.1”**
Max Turn Length **28.6”**

CONTINUOUS FIBER MOLDING

Benefits:

Continuous fiber combined with a thermoplastic matrix such as nylon makes for an extremely stiff, damage tolerant and lightweight structural composite part. A comparable part in machined aluminum would weigh 40-50% more. In addition to the high strength to weight ratio, they also have very good electrical conductivity and extremely low coefficients of thermal expansion. This simplifies tolerance issues for devices such as optical benches that would be affected by movement of a cover. It also simplifies many thermal management problems. Ballistic grade materials can be molded such as Kevlar and Spectra Fiber.




How It Works:

The continuous fiber thermoplastic composites are made through a melt and compression molding process, contrasting with conventional thermoset composites that rely on solvent-based chemistry and complicated cure schedules. Many of these materials can be molded in low cost aluminum molds; some higher temperature materials may require steel. Thermoplastics are extremely fast when compared to thermosets, averaging three minutes per part.

Recent Developments:

Rapid Composites has pioneered new methods allowing pre-consolidated materials to be rapidly heated, then shuttled to a mold and hot stamped in under 45 seconds to the net shape of a part. This is presently the fastest continuous fiber molding process in the world.

Lamborghini Gallardo and Audi R8 Floorboards

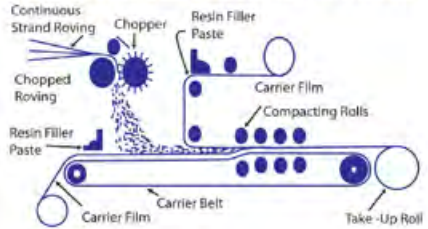
The Original Mold Time was 2.5 Hours
Now its Only 2.2 Minutes from Start to Finish

THERMOSET RAPID CURE COMPOSITES

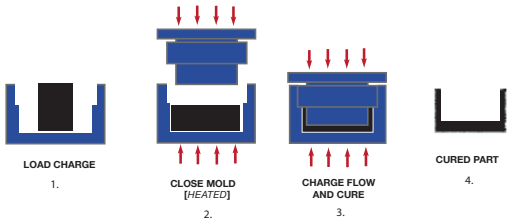
Rapid Composites routinely helps its clients determine the best materials and processing techniques. Snap-cure discontinuous composites may be a solution for parts with substantial variation in thickness and/or significant cost sensitivity.

The quasi-isotropic discontinuous structure of SMC (Sheet Molding Compound), BMC (Bulk Molding Compound) and EMC (Engineered Molding Compound) offer high-speed thermoset cycle-times with the ability to conform by dispersion within a sheer style mold. There is a near zero scrap-rate when using these materials.

Example Of Quasi-Isotropic Discontinuous Material Process



SMC/TMC/BMC/EMC Process Example



Quasi-isotropic Carbon Example

PRODUCT EXAMPLES

Rapid Composites has a diverse portfolio of clients with many unique opportunities. We take great pride in manufacturing quality products to the most exacting standards and attention to detail.

Our company's products have included mission critical and harsh environment devices for U.S. Special Operations Forces and advanced automotive components.

MILITARY

CF 2U Rack Mount Computer

CF PITCH Fiber Pin-Fin ATR

Bullray™ Amphibious VTOL UAS

CF Rack Mount Transit Case

CF PITCH Bonded-Fin ATR Chassis

CF Robot Sensor Unit

MILITARY

CF Rugged Hand Held Device

CF Marine Tablet PC

CF FLIR Biocular Display

Drivers Vision Enhancement (DVE)

CF Counter IED Manpack

CF M4 Rifle Kit

MILITARY

CF Flyaway SATCOM Positioner

CF LWTS Scope

CF Hand Held Tablet PC

CF Man Portable SATCOM System

PITCH/Aluminum and Copper Heat Sinks

CF MRT Tablet

MILITARY

CF Electronic Mobile Docking Station

CF Ambidextrous Hand Held Device

FLIR Controller

CF Ambidextrous Robot Controller

CF Hand Held Tablet

CF FLIR Biocular Controller

CF Flyaway Case

COMING SOON!

CF Gun Case

Rapid Composites Cases are 30%+ Lighter than the Competition

COMMERCIAL

Digital Retail Kiosk

Composite Metallic Hybrid Laptop

Composite LED Street Lamp

Thermal Scanning Device

Electronic Flight Bag (EFB)

Fiber Optic Analytical System

CONSUMER

CF Automotive Themed Travel Case

Digital Camera System

CF iPhone Cases

CF Headphones and Earbuds

CNC Machined Putter

Thumbsavers for Massage Therapy

CONSUMER

Defibrillator

Eyelid Retractor

Electric Cook-top Grill

Variable Pitch Propeller Controller

Space Efficient Inkjet Printer

Tablet Case Study

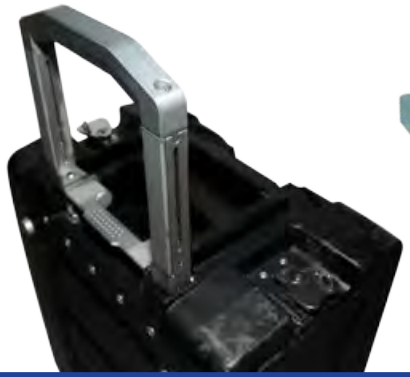
CLAD Case products are built for a discerning buyer who expects nothing but the best. These briefcases are fabricated from the most aesthetic carbon fiber, machined aluminum and fine leather. They even boast cartridge bearings at moving joints and gas strut openers. Clad can custom match both the interior and exterior to a favorite exotic car or private jet.

MEMBRANE KEYPADS

RUGGED MECHANISMS

Rapid Composites has developed a wide array of rugged and reliable patent pending cam latches, articulating joints, mounting solutions and handle mechanisms. We strive to offer simple, elegant and easy to operate products that set us apart from our competitors.

Custom Handles



Latch Mechanisms

Mounting Systems

CUSTOM EQUIPMENT & PROCESSING

Rapid Composites designs and builds custom equipment used for high-speed processing of thermoplastic and thermoset composite materials. We offer engineering services for the development of fully automated workcells with worldwide delivery and technical support.

Custom Fully Automated Composite Thermoplastic Heater and Press Systems

RAPID composites™

2216 72nd Dr. E.
Sarasota, FL 34243

www.rapidcomposites.com
Phone: (941) 322-6647
Fax: (941) 567-6696

Bullray™
AMPHIBIOUS VTOL UAS

JEC GROUP
WINNER OF 2015 INNOVATION AWARD