

# SOURIAU PA&E Technology Overview



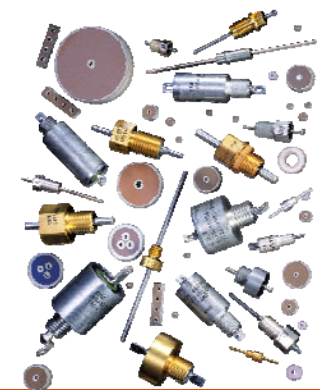
# Industries Served

- **Defense**
  - Military satellites
  - Self-guided missiles with infrared seeker systems
  - Advanced electronics for state-of-the-art combat aircraft
  - Sophisticated laser-guided systems
- **Space**
  - Communication satellites
  - Space shuttles
  - Launch vehicles
  - International Space Station
- **Medical**
  - Implantable cardiac devices
  - Neurostimulators
  - Cochlear implants
  - Spinal cord stimulators
- **Commercial**
  - Energy
  - Telecommunication
  - Aerospace



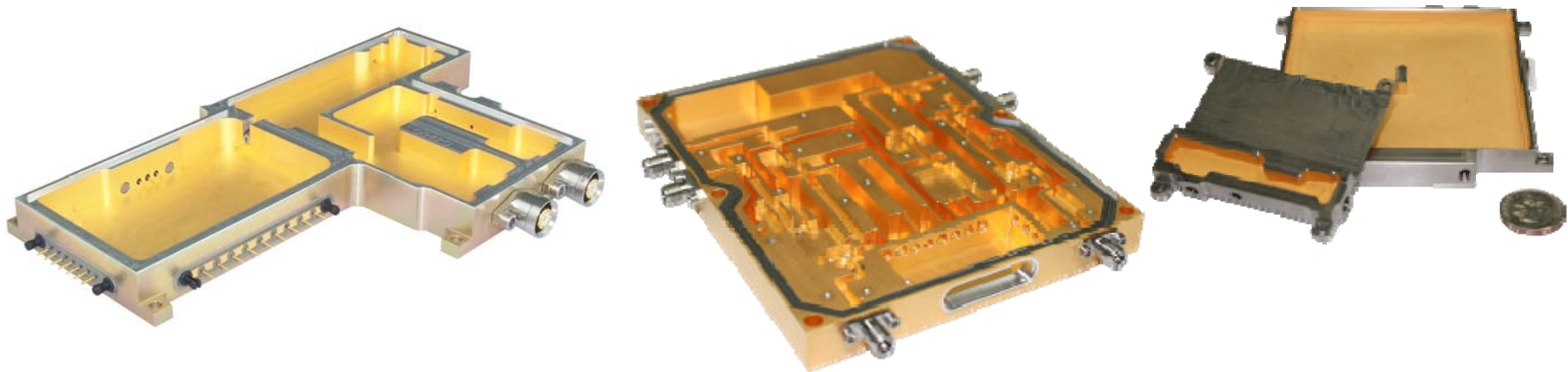
## Key Products

- Innovative hermetic electronic packaging solutions optimized for size, weight, thermal performance, CTE and more
- Custom DC, RF/microwave and fiber optic connectors that deliver high levels of electrical performance and hermetic reliability in the harshest environments
- Sight and waveguide windows with unique material combinations
- Hermetic, low-pass EMI filters in a wide variety of configurations and performance configurations
- Unique 'explosively bonded' metal material combinations that solve difficult material engineering challenges



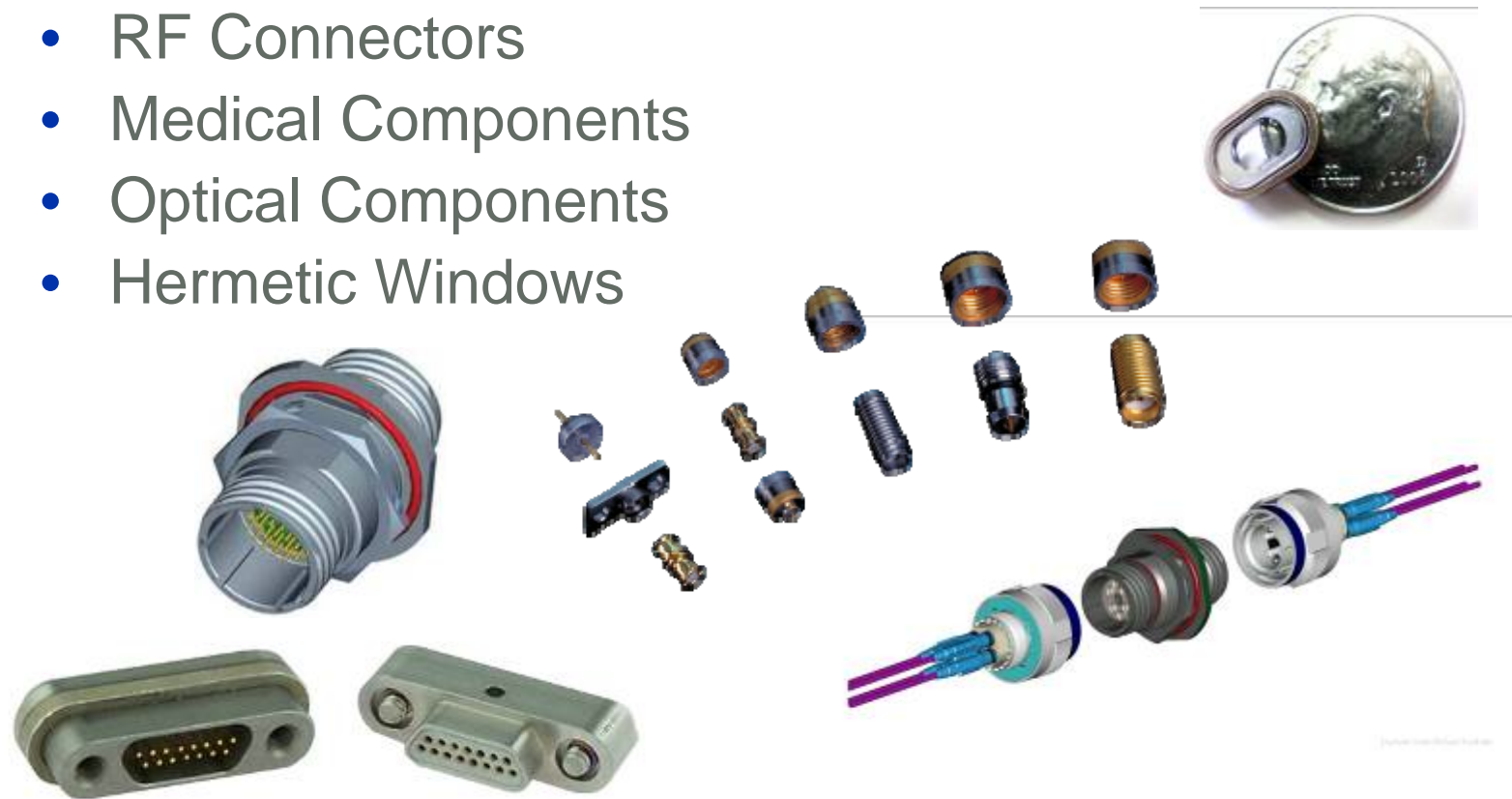
# Hermetic Integrated Packaging

- Hermetic Electronic Packaging
- Medical Implantable Packaging
- Titanium Composite Packaging
- Controlled Expansion Packaging



# Hermetic Interconnect Systems

- DC Connectors
- RF Connectors
- Medical Components
- Optical Components
- Hermetic Windows





## Bonded Metals

- Explosive Metal Bonding
  - Corrosive Resistance
  - Electrical & Thermal Conductivity
  - Weldable Transitions
  - Wear resistance
- Explosive Forming
- Explosive Hardening



# Integrated Electronic Packaging



## Rectangular DC connectors/Feedthrus

- Weldable to aluminum, titanium and iron/nickel alloys
- Insulator: Kryoflex polycrystalline ceramic
- Pin material: Beryllium copper 172/173
- Pin finish: Nickel gold plated

## Waveguide Windows

- Weldable to aluminum, titanium and iron/nickel alloys
- Window: Corning glass

## RF/Microwave thread-in Connectors

## RF/Microwave push-on Connectors

- Weldable to aluminum, titanium and iron/nickel alloys
- Insulator: 7070 corning glass
- Finish: Nickel/gold plated
- Interface: IAW MIL-STD-348
- Performance: IAW MIL-PRF-39012
- Impedance: 50 Ohms

## RF/Microwave Flange Mount Connectors

## Precision Machining and Metal Finish

- World class CNC machining capabilities
- Close-tolerance milling, turning and engraving
- Wire EDM/precision water jetting
- Aluminum titanium and iron/nickel alloys
- Anodizing, plating and painting facilities

## Explosively Bonded Metals

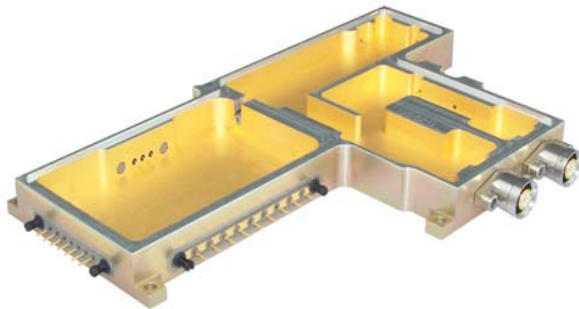
- Ferrous to non-ferrous transitions
- Layers bonded at the atomic level
- Eliminates inter-layer galvanic corrosion

**Laser Welding Eliminates Solder Joint Fatigue ... Forever!**



## Integrated Packaging: Features & Benefits

- Weight Reduction
  - Fusing lightweight aluminum and titanium with an explosive-bonding transition allows us to integrate more robust and reliable feedthrus and connectors into a lighter weight package
- Maximizing Thermal Conductivity
  - We use high-efficient thermal transfer technology in our integrated electronic packaging. One example of this is the housings

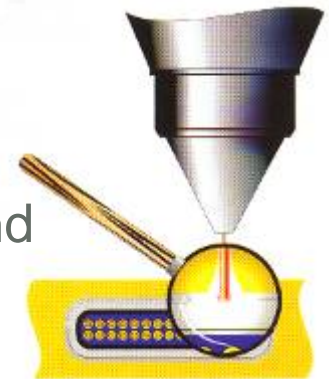


# Integrated Packaging: Features & Benefits

- Hermetic Seals
  - Kryoflex<sup>®</sup>, a proprietary polycrystalline ceramic sealing technology, is used to produce extremely rugged and reliable hermetic seals

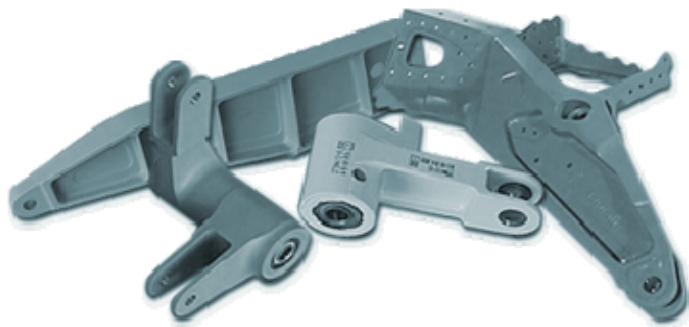


- Precision Laser Welding
  - We laser weld our feedthrus and connectors into integrated packages for higher integrity, reliability, and rework-ability than conventional soldered packages.



## Capabilities: Precision Machining

We are a world-class producer of machined and fabricated components, electronic packaging and assemblies for airframe manufacturers, aircraft/ground turbine engines, defense and space programs, medical and communications industries.



## Capabilities: Hermetic Sealing

- Ceramic Hermetic Seals - Kryoflex®
  - Kryoflex® Polycrystalline Ceramic — a multiple-phase derivative of ceramic oxide crystalline silicates — is a patented substance developed as a direct replacement for conventional compression glass and metalized alumina ceramics.



## Capabilities: Hermetic Sealing

- Glass Hermetic Seals
  - As an alternative to Kryoflex, we can provide glass-to-metal seals to reduce the cost of manufacturing, or when glass performance is required for the specific application.



## Capabilities: Brazing/Soldering

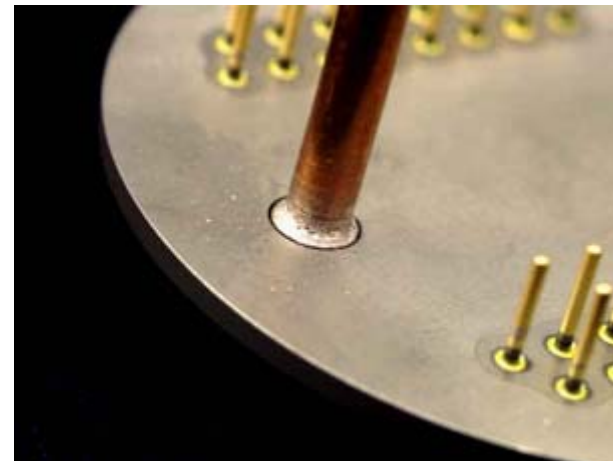
Our in-house vacuum brazing capabilities allow us to provide our customers with advanced metal-to-ceramic, metal-to-composite and metal-to-metal bonding solutions for use in fabricated components, electronic packaging and assemblies.

- Metal-to-Ceramic Bonding
  - Titanium-to-Zirconia
  - Invar-to-AlN



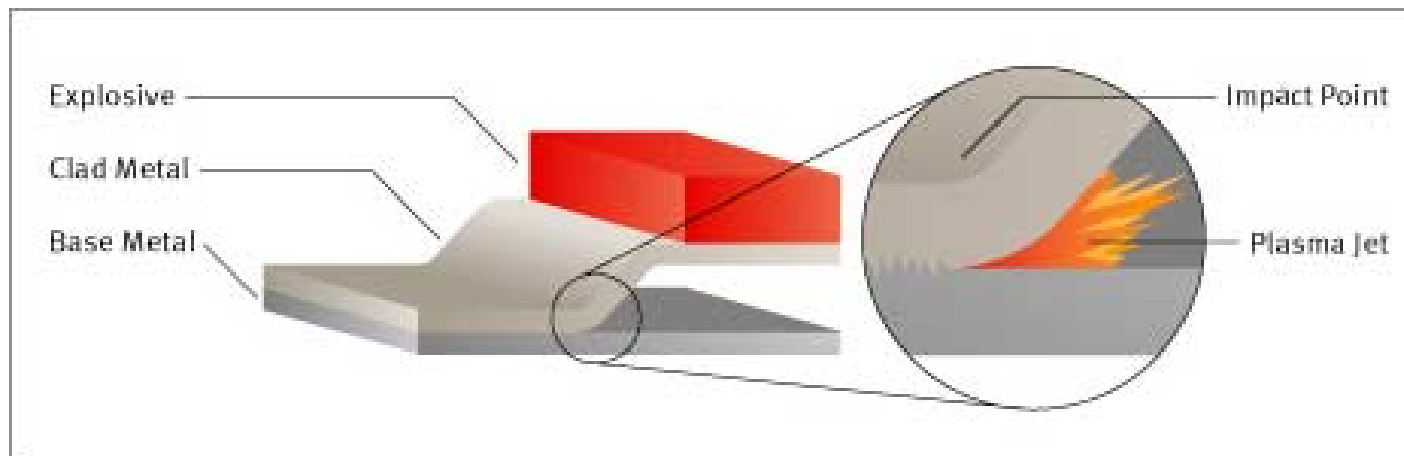
## Capabilities: Brazing/Soldering

- Metal-to-Composite Bonding
  - Titanium-to-CuMo
    - High Thermal Conductivity
    - Low Density
    - Low CTE
    - Connectors Install via LBW
    - Better Strength-to-Weight Ratio than Al
- Metal-to-Metal Bonding
  - Stainless-to-Stainless
  - Inconel-to-Stainless
  - Cu/SS-to-Cu/Ti



## Capabilities: Bonded Metals

- Joining Dissimilar Metals
  - Explosive bonding process can join ferrous and non-ferrous metals together at the atomic level
  - No galvanic corrosion
  - Ideal for weld transitions, or any other application where you need the benefits of two different metals in a single work-piece



# Capabilities: Bonded Metals Matrix

	Zirconium	Vanadium	Tungsten	Titanium	Tantalum	Steel alloy	Steel, mild	Steel, SS304	Silver	Rhenium	Platinum	Palladium	Niobium	Ni alloy	W alloy	Moly alloy	Molybdenum	Magnesium	Kovar	Indium	Hafnium	Gold	Copper alloy	Copper	Beryllium Cu	Al Bronze	Al alloy	Aluminum
Aluminum	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Al alloy	X	X	X	X	X	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Al Bronze	O	X	O	O	X	X	X	O	O	O	X	O	X	O	O	X	X	O	X	X	X	X	X	X	X	X	X	X
Beryllium Cu	O	X	O	O	X	O	X	O	X	O	X	O	X	O	O	X	X	O	O	O	O	X	X	X	X	X	X	X
Copper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X
Copper alloy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X
Gold	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X
Hafnium	O	X	X	O	X	X	X	X	X	X	X	X	X	O	O	X	X	O	X	X	X	X	X	X	X	X	X	X
Indium	X	X	X	O	X	O	O	X	O	O	X	O	X	O	O	X	X	O	X	X	X	X	X	X	X	X	X	X
Kovar	O	X	X	O	X	X	X	X	O	X	O	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X
Magnesium	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X	X	X	X
Molybdenum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Moly alloy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nickel	X	X	X	X	X	X	X	X	O	X	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ni alloy	O	X	X	O	X	X	X	X	X	O	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Niobium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Palladium	O	O	O	O	O	X	O	O	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Platinum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rhenium	O	X	X	O	X	O	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Silver	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steel, SS304	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steel, mild	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steel alloy	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tantalum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Titanium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tungsten	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vanadium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zirconium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

**METAL COMPATIBILITY CHART**

X Bonded Metal Substrate  
 O High Temp Inert Gas

## Capabilities: Plating and Metal Finishing

SOURIAU PA&E has over 20 years of experience in metal surface finishing. We are experts at plating a variety of metals including aluminum, titanium, iron/nickel alloys, copper and even our explosive bonded bi-metallic transition materials. We have a staff of certified chemical and process engineers, which allow us to plate your parts in-house where we can maintain finite control over these critical finishing processes.

- Electrolytic Gold - ASTM-B488 and MIL-G-45204
- Electrolytic Nickel - QQ-N-290 and ASTM-B733
- Electrolytic Tin-Lead - MIL-T-10727
- Electrolytic Copper - MIL-C-14550
- Electroless Nickel - MIL-C-26074
- Chromate Conversion - MIL-C-5541



## Capabilities: Laser Welding

SOURIAU PA&E utilizes the latest state-of-the-art Lasag laser welding systems to permanently join materials using the radiation from a focused, energy dense, beam of infrared light. This non-contact welding process minimizes thermal and mechanical stresses, along with providing an extremely small heat affected zone, ensuring your component or electronic packaging sees the least hostile welding environment possible.



# Capabilities: Conformance Testing

- Electrical Testing - per MIL-STD-202, Method, 301 and 302
- Solderability Testing - per MIL-STD-883, Method 2003
- Thermal Cycle Testing - per MIL-STD-883, Method 1010
- Thermal Shock Testing - per MIL-STD-883, Method 1011
- X-Ray Fluorescence Testing - per ASTM-B568
- Metallurgical Testing
- Push-Out Strength Testing
- Vibration Testing

XRF Tester  
(Plating Thickness)



Environmental Testing Chamber  
(Temp Cycling)



Leak Tester



# Learn more

- Visit us online at <http://www.pacaero.com>
- Speak to one of our application engineers: 609-664-8000
- Send us an e-mail: [sales@pacaero.com](mailto:sales@pacaero.com)

