

Coating Solutions  
for the **aerospace & defence** industries



 **Bodycote**



## Peace of mind for aerospace manufacturers for over 30 years

### Quality assured

**The world's leading aerospace and defence companies entrust their products to Bodycote's care.**

Bodycote holds all relevant international and national aerospace quality accreditations – such as **ISO 9001**, **AS 9100**, **ISO 14001** and **Nadcap** – as well as those of all the major aerospace and defence companies, where we hold 'preferred supplier' status.

Bodycote customers can be confident their demands can be met, however stringent, with assured quality, cost-effectiveness and on-time completion every time.



### Exceptional customer service

**Providing exceptional customer service is the foundation of everything we do.**

Component reliability can determine your operation's success. That's why we invest in and provide you with progressive technology and a team that can deliver the highest quality every time. Bodycote ensures your components deliver maximum performance that's more efficient, cost effective and environmentally friendly.

**Aerospace and defence companies around the world trust Bodycote with approvals for our high performance coatings.**

## Surface Technology

As one of the first industries to fully adopt thermally sprayed coatings into the design of precision engineered components, aerospace applications have been a focus of Bodycote's thermal spray activities. Bodycote offers over 100 key thermally sprayed aerospace applications for a range of material properties.

### Advanced thermal spray coating applications include:

- Thermal management
- Wear
- Oxidation
- Corrosion resistance
- Sealing systems
- Vibration, sound absorbance, chrome conversion
- Component repair

### Thermal spray processes:

- HVOF
- Plasma
- Combustion Spray

### Ceramic technology:

- Thermochemical ceramic coatings
- Ceramic densification
- Chrome enhancement

## Sealing solutions

Bodycote offers a range of sealing solutions to enhance coating performance.

- Organic sealers
- Pressure sealing
- HVOF seal
- Chrome seal – Bodycote provides a unique, proprietary thin-film technology for both thermal spray and chrome plate, which out-performs conventional organic sealing methods. This technology thermochemically diffuses through the coating, sealing porosity with super-hard ceramic particles.

## Precision finishing and inspection

All our coating facilities are equipped with precision and finishing machines capable of achieving surface requirements to the highest standards.

Key processes include:

- Turning
- Milling
- Grinding
- Honing
- Super-finishing
- NDT
- CMM measurement
- In-house laboratories

## Our unrivalled processing power gives you the competitive edge



## REACH

Under REACH, hard chrome plating is to be heavily restricted; Bodycote Surface Technology acknowledges the mandate to replace chrome with alternative, less harmful materials which meet the legislative criteria. We offer environmentally friendly coating solutions as a direct alternative to chrome plate, providing superior wear and corrosion resistance.

Our HVOF coatings are already being designed and used as a direct alternative for hard chrome plate for specific components including:

- Aircraft landing gear
- Flight control – Actuation
- Propeller hubs
- Gas turbine journals

Bodycote operates an international network of quality accredited facilities, in support of prime aerospace manufacturers and their supply chains, serving the commercial aerospace, defence, helicopter and space markets.



### 1. Landing gear

The nature and position of this critical component demands both strength and high resistance to wear and corrosion to fulfil design requirements. Environmentally friendly thermal spray processes such as HVOF have superseded traditional coating methods to aid corrosion and wear resistance properties. HVOF-applied tungsten carbide is proven against hard chrome plate as a direct replacement.



### 4. Main rotor

The rotor must withstand centrifugal forces, vibration, abrasion, and corrosion, whilst turning the blades and providing essential inputs to flight control components. HVOF coating is applied to improve resistance, whilst tail rotor blades receive surface coatings to improve their abrasion resistance.



### 2. Engine

Aircraft engines are designed and built to work in extreme conditions and meet ever changing environmental legislations. Coatings are used to improve engine efficiency by enhancing anti-fretting, anti-galling and wear resistance, providing protection for the base material and extending service life.



### 5. Drive shaft

The tail rotor and gearbox's dependency on the main gear box requires the long drive shaft to be extremely strong, yet lightweight. HVOF coating delivers the required resistance to corrosion and vibration.



### 6. Flight control

Flight controls are essential to all aircraft. For example helicopter flight controls are essential to drive the speed and pitch of the rotor blades. Surface technology treatments are applied to improve resistance and increase precision, while maintaining a light weight.



### 3. Main gear box

In gear box assemblies, all critical parts are designed for resistance to vibration, high pressure and temperatures - typical military helicopter specifications require the main gear box to perform at full power for up to two hours without oil. Bodycote provides surface coating treatments which are essential to high precision, hydraulic control components.



### 7. Propulsion

A rocket relies on its propulsion system for thrust at take-off and again in space to change velocity. High nickel and refractory alloys are used to meet these demands and extend component life under these extreme operating environments. A comprehensive range of fused coatings is used to isolate the environment preventing oxidation of the underlying material.



### 8. Aerostructures

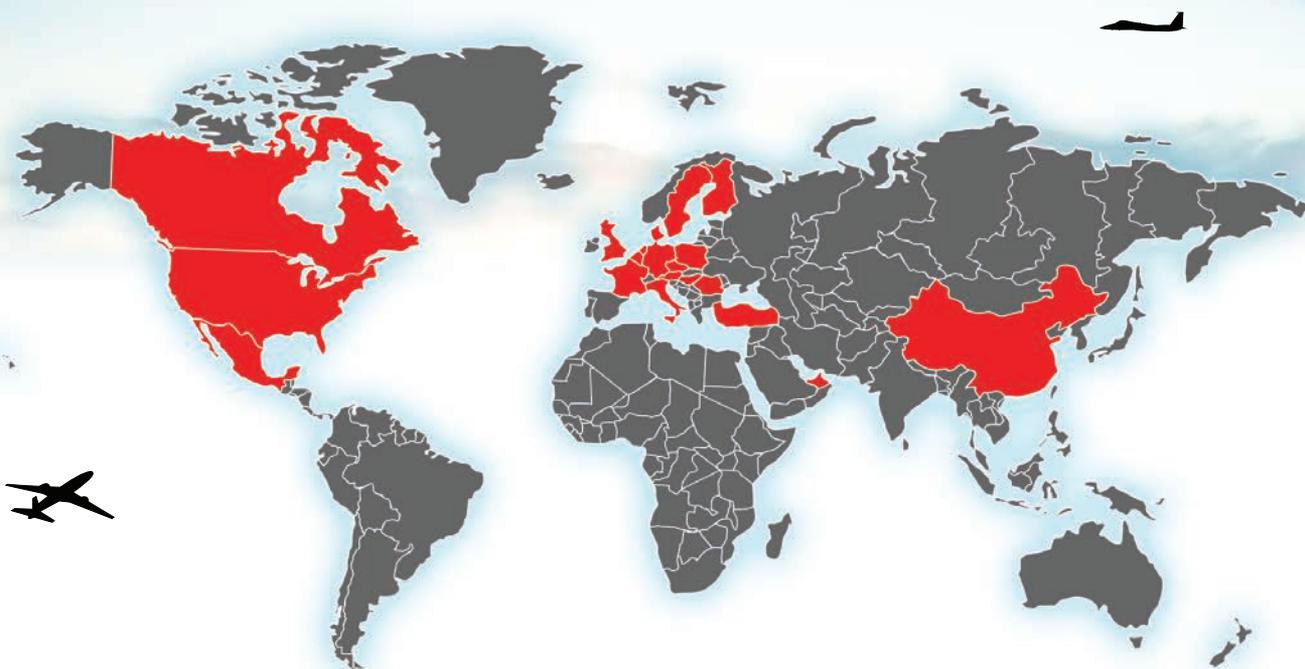
Aerostructures need to be lightweight and at the same time withstand mechanical stresses and vibrations. In addition, pylon components are subjected to high loads and sometimes elevated temperatures. Aluminium and titanium alloys are often used for their low density but have poor sliding properties and a tendency to galling. Thermal spray coatings, such as Molybdenum, Triballoy®, tungsten carbide, CuNi alloy are solutions that offer temperature resistance, sliding, fretting and anti-galling properties.



Materials family	Icon code	Bodycode coating	Technology	Max temperature	Chemical composition	Properties & applications	Parts examples
<b>Abradables</b>	2	BC-AS-AB05	Plasma	325°C	AlSi/Po	Clearance control on cold section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
	2	BC-AS-AB06	Plasma	450°C	AlSi/Po/BN	Clearance control on moderately hot section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
	2	BC-AS-AB07	Plasma	750°C	CoNiCrAlY/Po/BN	Clearance control on hot section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
<b>Ceramics</b>	2	BC-AS-CE05	Plasma	1100°C	Al <sub>2</sub> O <sub>3</sub> /3TiO <sub>2</sub>	Hardened surface against abrasives, thermal barrier, tougher than pure alumina	Segments, ring sectors, sealairs
	2, 7	BC-AS-CE10	Plasma	1250°C	ZrO <sub>2</sub> /8Y <sub>2</sub> O <sub>3</sub>	Partially stabilised zirconia, thermal barrier coatings, hardened surface against abrasives,	Blades teeth, transition ducts, combustion chambers
	1,2,3,4,5	BC-AS-CE14	Plasma	540°C	Cr <sub>2</sub> O <sub>3</sub>	Hard bearing surfaces, anti-galling	Bushings, bearings, disks, shafts, rings
	2,4,5	BC-AS-CE16	HVOF	1650°C	Al <sub>2</sub> O <sub>3</sub>	Hard and dense coating, anti-galling, electrical insulation	Balls, bearings, bushes, shafts
<b>Metallics</b>	2,4,5,6,8	BC-AS-ME56	Plasma	315°C	Cu <sub>36</sub> Ni <sub>5</sub> In	Anti-fretting	Blade roots, balls, bearings
	1,2,4,8	BC-AS-ME48	Plasma	800°C	Co <sub>28</sub> Mo <sub>8</sub> Cr <sub>3</sub> Si (Triboloy® 400)	High temperature sliding, anti-galling	Pins, manifolds, seals, bushings, finger seals
	2,4,8	BC-AS-ME19	Plasma	800°C	Co <sub>28</sub> Mo <sub>17</sub> Cr <sub>3</sub> Si (Triboloy® 800)	High temperature sliding, anti-galling	Turbine blades, vent tubes, disks, pins, manifolds
	1,3,8	BC-AS-ME21	Plasma	320°C	Mo	Anti-galling, sliding, fretting	Balls, bearings, bushes
	2,3	BC-AS-ME39	Combustion Wire	450°C	Al <sub>6</sub> Si	Salvage and restoration aluminium, used also as abrasible	Bearings, seals
	2	BC-AS-ME22	Combustion Wire	550°C	Fe <sub>13</sub> Cr <sub>0.5</sub> Mn <sub>0.5</sub> Ni <sub>0.35</sub> C <sub>0.25</sub> Si; (Metcoloy 2)	Salvage and restoration stainless steel	Bearings, seals
	2	BC-AS-ME07	Combustion Wire	650°C	Ni <sub>20</sub> Al	Bond coat, salvage, build up	Various
	2	BC-AS-ME04	Plasma	650°C	Ni <sub>5</sub> Mo <sub>5.5</sub> Al	Wear and scuff resistance, high toughness	Bearings, seals
	2	BC-AS-ME02	Plasma	800°C	Ni <sub>5</sub> Al	Bond coat, salvage, build up	Bond coat on ceramics, abrasibles
	2,7	BC-AS-ME11	Plasma	1050°C	Ni <sub>22</sub> Cr <sub>10</sub> Al <sub>1</sub> Y	High temperature bond coat	Bond coat on thermal barrier coatings
	2	BC-AS-ME01	HVOF	850°C	CoNiCrAlY	High temperature corrosion resistance, clearance control	Rings, segments, assemblies
	2	BC-AS-ME57	HVOF	1050°C	NiCoCrAlYT <sub>a</sub>	High temperature corrosion and erosion resistance	Turbine blades
	2,3	BC-AS-ME58	HVOF	700°C	Ni <sub>19</sub> Cr <sub>18</sub> Fe <sub>3</sub> Mo <sub>1</sub> Al; 5(Nb+Ta)1Ti0.1C; (Inconel 718)	Repair, rebuild of Inco 718 parts	Disks
2, 8	BC-AS-ME59	HVOF	350°C	CuAlFeNi+C	Anti galling, sliding, fretting	Balls, seals, bearings	
<b>Carbides</b>	2,7,8	BC-AS-CA23	HVOF	870°C	Cr <sub>3</sub> C <sub>2</sub> /NiCr	High erosion resistance, high temperature resistance	Bearings, seals, blades
	2,3,4,5,	BCW-AS-CA01	Plasma	500°C	WC/12Co	Hard bearing surfaces, anti sliding	Bushings, bearings, disks, shafts, rings
	2,3,4,5	BCW-AS-CA07	Plasma	500°C	WC/17Co	Hard bearing surfaces, tough coating	Bushings, bearings, disks, shafts, rings
	1,2,3,4,5,6,8	BCW-AS-CA17	HVOF	500°C	WC/17Co	Hard bearing surfaces, tough coating	Bushings, bearings, disks, shafts, rings, finger seals, pins, firewalls, xstops, tracks
	1,2,3,4,5,6,8	BCW-AS-CA19	HVOF	500°C	WC/10Co/4Cr	Hard bearing and sliding surfaces, good corrosion resistance	Actuators, landing gears, pins, bushings, bearings, pistons, tie bars

As the global leader in thermal processing, Bodycote has been at the forefront of surface engineering technologies, developing a world-class range of thermal spray, diffusion and slurry coatings.

Our Surface Technology operations span three continents and are managed by some of the best engineers and technicians in the industry, with the experience and expertise to provide vital support and a real understanding of customer requirements.



Over 170 locations in 21 countries...



[www.bodycote.com](http://www.bodycote.com)

Operating an international network of facilities and serving a wide range of industries, Bodycote is the world's largest and most respected provider of thermal processing services – a vital link in the manufacturing supply chain.

Bodycote operates in two major areas; the Aerospace, Defence & Energy business serves the aerospace, defence, power generation and oil & gas industries, whilst the Automotive & General Industrial business serves sectors including automotive, construction, tooling, medical and transportation.

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