

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



Bodycote

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 insulation and thermal conductivity
- Wear
- Oxidation
- Corrosion resistance
- Sealing systems
- Vibration, sound absorbance, chrome conversion
- Component repair

Thermal spray processes:

- HVOF
- Plasma
- Combustion spray

Sealing solutions

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

- Organic sealers
- Pressure sealing
- HVOF seal

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
- Non-destructive testing
- CMM measurement
- Robotised polishing
- In-house laboratories

Our unrivalled processing power gives you the competitive edge



REACH

Under REACH, hard chrome plating is 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 and plasma 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 and shafts



Leading the industry in engineered coating solutions

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 to deliver high performance coatings.

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.



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.



3. Main gearbox

In gearbox assemblies, all critical parts are designed for resistance to vibration, high pressure and temperatures - typical military helicopter specifications require the main gearbox 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.



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.



5. Drive shaft

The tail rotor and gearbox's dependency on the main gearbox 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 lightweight.





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 are 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, Tribaloy®, tungsten carbide, CuNi alloy are solutions that offer temperature resistance, sliding, fretting and anti-galling properties.



Materials family	Icon code	Bodycote coating	Technology	Max temperature
Abradables	2	BC-AS-AB05	Plasma	325°C
	2	BC-AS-AB06	Plasma	450°C
	2	BC-AS-AB07	Plasma	750°C
Ceramics	2	BC-AS-CE05	Plasma	1100°C
	2, 7	BC-AS-CE10	Plasma	1250°C
	1,2,3,4,5	BC-AS-CE14	Plasma	540°C
	2,4,5	BC-AS-CE16	HVOF	1650°C
Metallics	2,4,5,6,8	BC-AS-ME56	Plasma	315°C
	1,2,4,8	BC-AS-ME48	Plasma	800°C
	2,4,8	BC-AS-ME19	Plasma	800°C
	1,3,8	BC-AS-ME21	Plasma	320°C
	2,3	BC-AS-ME39	Combustion Wire	450°C
	2	BC-AS-ME22	Combustion Wire	550°C
	2	BC-AS-ME07	Combustion Wire	650°C
	2	BC-AS-ME04	Plasma	650°C
	2	BC-AS-ME02	Plasma	800°C
	2,7	BC-AS-ME11	Plasma	1050°C
	2	BC-AS-ME01	HVOF	850°C
	2	BC-AS-ME57	HVOF	1050°C
	2,3	BC-AS-ME58	HVOF	700°C
	2, 8	BC-AS-ME59	HVOF	350°C
Carbides	2,7,8	BC-AS-CA23	HVOF	870°C
	2,3,4,5,	BCW-AS-CA01	Plasma	500°C
	2,3,4,5	BCW-AS-CA07	Plasma	500°C
	1,2,3,4,5,6,8	BCW-AS-CA17	HVOF	500°C
	1,2,3,4,5,6,8	BCW-AS-CA19	HVOF	500°C



Chemical composition	Properties & applications	Parts examples
AlSi/Po	Clearance control on cold section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
AlSi/Po/BN	Clearance control on moderately hot section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
CoNiCrAlY/Po/BN	Clearance control on hot section of rotating turbine parts	Vane assemblies, seals, rings, supports, liners, wheels, sectors
Al ₂ O ₃ /3TiO ₂	Hardened surface against abrasives, thermal barrier, tougher than pure alumina	Segments, ring sectors, seal teeth
ZrO ₂ /8Y ₂ O ₃	Partially stabilised zirconia, thermal barrier coatings, hardened surface against abrasives	Blades teeth, transition ducts, combustion chambers
Cr ₂ O ₃	Hard bearing surfaces, anti-galling	Bushings, bearings, disks, shafts, rings
Al ₂ O ₃	Hard and dense coating, anti-galling, electrical insulation	Balls, bearings, bushes, shafts
Cu ₃₆ Ni ₅ In	Anti-fretting	Blade roots, balls, bearings
Co ₂₈ Mo ₈ Cr ₃ Si (Triboloy® 400)	High temperature sliding, anti-galling	Pins, manifolds, seals, bushings, finger seals
Co ₂₈ Mo ₁₇ Cr ₃ Si (Triboloy® 800)	High temperature sliding, anti-galling	Turbine blades, vent tubes, disks, pins, manifolds
Mo	Anti-galling, sliding, fretting	Balls, bearings, bushes
Al ₆ Si	Salvage and restoration aluminium, used also as abrasible	Bearings, seals
Fe ₁₃ Cr _{0.5} Mn _{0.5} Ni _{0.35} C _{0.25} Si; (Metcoloy 2)	Salvage and restoration stainless steel	Bearings, seals
Ni ₂₀ Al	Bond coat, salvage, build up	Various
Ni ₅ Mo _{5.5} Al	Wear and scuff resistance, high toughness	Bearings, seals
Ni ₅ Al	Bond coat, salvage, build up	Bond coat on ceramics, abrasibles
Ni ₂₂ Cr ₁₀ Al ₁ Y	High temperature bond coat	Bond coat on thermal barrier coatings
CoNiCrAlY	High temperature corrosion resistance, clearance control	Rings, segments, assemblies
NiCoCrAlYTa	High temperature corrosion and erosion resistance	Turbine blades
Ni ₁₉ Cr ₁₈ Fe ₃ Mo ₁ Al; 5(Nb+Ta)1Ti0.1C; (Inconel 718)	Repair, rebuild of Inco 718 parts	Disks
CuAlFeNi+C	Anti galling, sliding, fretting	Balls, seals, bearings
Cr ₃ C ₂ /NiCr	High erosion resistance, high temperature resistance	Bearings, seals, blades
WC/12Co	Hard bearing surfaces, anti sliding	Bushings, bearings, disks, shafts, rings
WC/17Co	Hard bearing surfaces, tough coating	Bushings, bearings, disks, shafts, rings
WC/17Co	Hard bearing surfaces, tough coating	Bushings, bearings, disks, shafts, rings, finger seals, pins, firewalls, x-stops, tracks
WC/10Co/4Cr	Hard bearing and sliding surfaces, good corrosion resistance	Actuators, landing gears, pins, bushings, bearings, pistons, tie bars



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.

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.

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