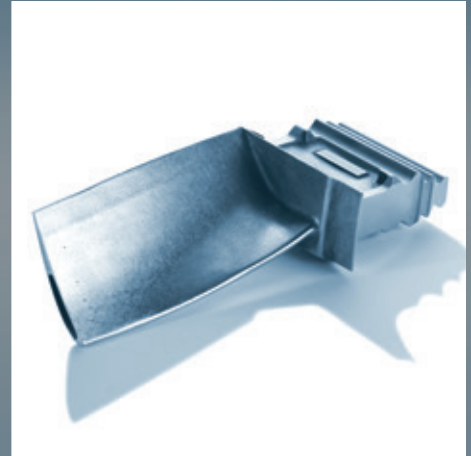
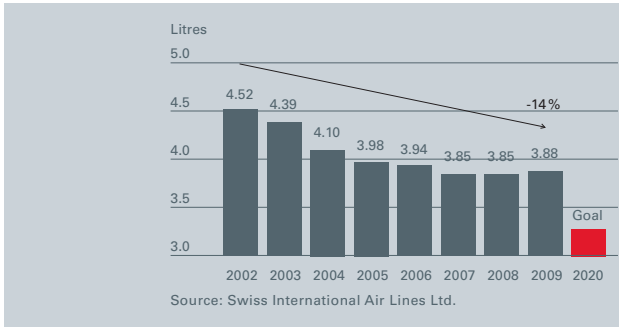


# AEROSPACE



## Lower Cost and Environmental Impact



Specific fuel consumption per passenger

The aerospace industry is increasingly focused on reducing carbon footprint, maintenance and total operating costs. Advanced materials are key contributors to achieving the goals of lower weight, extended life and reduced fuel consumption.

Ionbond continues to be at the forefront of the engineering of surface treatments enabling the use of conventional and alternative lightweight materials to increase performance and reduce the overall cost of ownership. Unlike many conventional surface finishes PVD technology is environmentally friendly with no toxic by products.



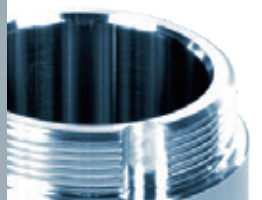
### Hard chromium replacement technology

Ionbond Tribobond™ PVD coatings exhibit properties that meet or exceed the hard chromium they replace and can be specifically optimized for each application. For example; Tribobond™ 30 (CrN) with a typical thickness of 5–10 microns is much thinner than hard chromium, offers increased hardness, a reduced coefficient of friction and enhanced adhesion with less tendency to crack. Fine features like threads, recesses etc. are maintained. Unlike with hard chromium plating there is no need to machine back to size which results in shorter manufacturing time and lower overall component cost.

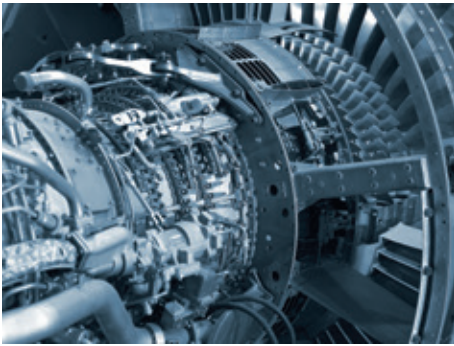


### Quality assured

Ionbond facilities hold an extensive range of international accreditations, including ISO 9001, AS 9100, ISO 9002, and NADCAP. Ionbond also holds numerous major aerospace systems and component supplier approvals. We are pleased to work in partnership with our clients developing solutions, processes & procedures to meet their individual needs.



## Improved Performance and Capability



### Harsh environment

Combined with superior metals used for the base components, Ionbond Tribobond™ coatings are the surface treatments of choice for longer lifetime and better efficiency. Films are routinely being applied to enhance the components properties. They can be designed to provide thermal barrier or transfer properties across a wide range of load and temperature conditions. Typical applications include engine and mechanical parts, bearings and actuators.

- ▶ Reduced friction, galling, erosion and fretting
- ▶ High temperature resistance
- ▶ Chemically inert

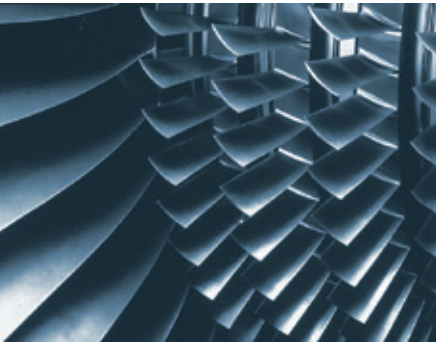
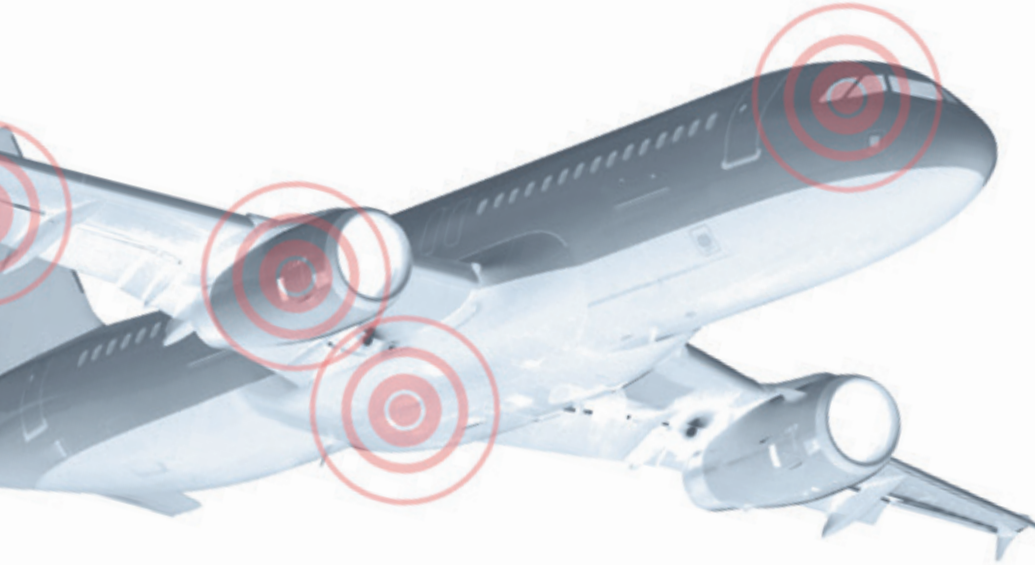


### Extended lifetime

Many systems on aircrafts are subject to dust and dirt contamination, and both mechanical and thermal shocks. Tribobond™ 40, an amorphous diamond like carbon coating, has superior self lubrication characteristics and hardness (compared with conventional, lubricated metal surfaces), exhibits lower wear and extends overall service life and maintenance intervals. The use of such coatings reduces operating costs, spares inventories, maintenance times and complexity resulting in cost optimisation and minimum environmental impact.

- ▶ Increased surface hardness
- ▶ Self lubricating
- ▶ Low wear properties





## Diffusion coatings for turbine blades

Turbine blades are the hottest parts in jet engines and are exposed to extremely tough conditions. Even inside the cooling channels super alloys based blades fail by hot corrosion. Ionbond offers coating services and sells CVD equipment to provide efficient protection in such critical areas. As opposed to the conventional packing method the CVD applied coatings exhibit uniform thickness. The aluminum based diffusion coatings with self-healing feature provide extended lifetime to blades. Doped and alloyed coatings are available, customized to the particular needs.


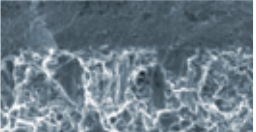

- ▶ Higher temperature operation
- ▶ Increased fuel efficiency
- ▶ Reduction of hot corrosion

## Cutting tools for modern material machining

Composite materials and hard metal alloys are increasingly being used in airframes and aerospace components to improve performance and reduce environmental impact. Ionbond has developed special coatings for such tools to extend the lifetime and increase the productivity.



## Ionbond Aerospace Coatings

Technology	PA-CVD	PVD	CVD	Arc-PVD
Coatings	Tribobond™ 40, 41 Cr/a-C:H:W Cr/a-C:H:W+a-C:H	Tribobond™ 01, 20, 30 TiN, TiAlN, CrN	Bernex 66 Al	Ionbond™ 08 TiSiN Hardcut
Structure	Gradient DLC ; WC/C aDLC with underlayers, Cr or CrN	Columnar/Nano-grains	Crystalline	Multilayer with Nano-composite TiSiN
Cross Section Micrographs				
Deposition Temperature	<200 °C	200 – 450 °C	800 – 1050 °C	450 °C
Characteristics	<ul style="list-style-type: none"> <li>▶ Amorphous top layer</li> <li>▶ High hardness</li> <li>▶ Low friction coefficient</li> <li>▶ Hardness gradient</li> </ul>	<ul style="list-style-type: none"> <li>▶ Columnar structures</li> <li>▶ Tunable hardness</li> <li>▶ High thickness possible</li> <li>▶ Low friction coefficient</li> <li>▶ Temperature resistance (500 – 900 °C)</li> </ul>	<ul style="list-style-type: none"> <li>▶ Excellent adherence</li> <li>▶ High thickness possible</li> <li>▶ Corrosion inhibiting</li> <li>▶ Uniform thickness</li> </ul>	<ul style="list-style-type: none"> <li>▶ Multilayer structure</li> <li>▶ High hardness</li> <li>▶ Good abrasion resistance</li> <li>▶ High temperature resistance 1200 °C</li> <li>▶ Optimized for high end carbide tooling</li> </ul>
<b>Wear mechanisms</b>				
Fatigue (impact)	✓ ✓ ✓	✓ ✓		✓ ✓ ✓
Adhesive (galling/scuffing)	✓ ✓ ✓	✓ ✓		✓ ✓
Abrasive	✓ ✓	✓ ✓		✓ ✓
Fretting	✓ ✓ ✓	✓ ✓		✓ ✓ ✓
Erosion	✓	✓ ✓		✓ ✓
Oxidation	✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓
<b>Component applications</b>				<b>Cutting</b>
	Landing gear Bearings Gears Seals Hydraulics	Bearings Fasteners Seals Control mechanisms Thrust reverser	Turbine blades	Machining operations for: Carbon fibre materials Titanium based alloys Nickel based alloys

For a complete coating listing please see [www.ionbond.com](http://www.ionbond.com)



# Competence and Innovation – Worldwide

Ionbond is a leader in surface enhancement technology and provides advanced coating solutions featuring a broad range of hard, low friction, wear resistant coatings based on PVD, PACVD and CVD technologies for a wide range of applications. It has a global presence with coating centers in strategic locations across Europe, Asia, and North America and has one of the largest coating networks in the world.

Ionbond is part of the IHI Group, a Japanese industrial group with significant R&D resources that operates through multiple business fields including: Energy and Resources, Social Infrastructure, Industrial Machinery and Aero Engines.



## Global and regional headquarters

### IHI Ionbond

Group Headquarters  
Uetlibergstrasse 132  
CH-8045 Zürich  
Phone: +41 44 298 50 70  
info@ionbond.com

### Ionbond Switzerland - Dulliken

Coating Center  
Industriestrasse 9  
CH-4657 Dulliken  
Phone: +41 62 553 42 00  
infoch@ionbond.com

### Ionbond France – Lyon

Services Headquarters  
Europe Zone 1  
25, rue des Frères-Lumière  
FR-69680 Chassieu  
Phone: +33 4 72 79 46 60  
Fax: +33 4 72 79 46 61  
infofr@ionbond.com

### Ionbond Netherlands – Venlo

Services Headquarters  
Europe Zone 2  
van Heemskerckweg 30  
NL-5928 LL Venlo  
Phone: +31 77 465 65 65  
Fax: +31 77 351 34 99  
infnl@ionbond.com

### Ionbond US – Michigan

Services Headquarters  
NAFTA  
1823 East Whitcomb  
Madison Heights  
USA MI 48071  
Phone: +1 248 398 9100  
Fax: +1 248 398 2110  
infous@ionbond.com

### Ionbond China – Wuxi

Services Headquarters  
Asia  
Building 17-B  
No. 15 Hanjiang Road  
Wuxi New District  
Wuxi City, Jiangsu Province  
China (Postcode: 214028)  
Phone: +86 510 8815 2528  
Fax: +86 510 8181 6819  
infoch@ionbond.com

See our website for a full list of all coating centers and local equipment sales offices. [www.ionbond.com](http://www.ionbond.com)

